JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

The Budget—Investment and Other Topics.

THERE was only one imposing subject of interest last week, and that was the Budget, with the scheme of the Chancellor of the Exchequer for meeting the startling deficit of nearly 16 millions sterling shown by the nation's balance-sheet. The methods that Mr. Lloyd George has propounded for straightening out matters have been variously received. A socialistic budget is the verdict of all who are not extreme upholders of the Government; and when the proposals for rectifying the deficiency are examined one by one, the verdict does not appear to be against the weight of evidence. To satisfy requirement, the Chancellor dips his hands freely into capital, attacks industry, adds to the burden of investment, and sets up a further obstacle to the spirit of thrift. The Budget throughout has been designed on the principle that the burdens of the nation ought to be—not equally, but unequally borne. Among much for regret, there is one thing the gas industry are grateful for, and it is that the rumoured tax on coal (which idea was very properly ungraciously received by the country) has not materialized.

On the other hand, there is the increase in the stamp duties in connection with dealings in securities, which must have an influence in the direction of the restriction of investment at home, and in diverting capital to other countries. The man who saves money, upon the interest derived from which he hopes to live in old age, pays well for the privilege of being allowed to look forward to a little rest and leisure later on in life. He is taxed for earning an income, he is taxed for investing a portion of it, and he is taxed perpetually on the proceeds of the investment. The proceeds are miscalled "unearned" income; and he is now to be taxed on this—not at 1s. in the pound, but at 1s. 2d.; and those who have unearned incomes on the higher scale are to pay still more by way of a super-tax. We will not go into details, as they are already well known. Among others, shareholders in gas companies will have to bear at any rate the 1s. 2d. impost, because—the distinction is a nice one—though the profits are earned by the shareholders in their corporate capacity, they are unearned by them individually. There is a fear, too, as the announcement of the Chancellor of the Exchequer stands, that all joint-stock concerns making profits of above £5000 will have to pay the super-tax. If so, it will mean that the greater part of the income of the country from joint-stock enterprise will have to bear a tax of 1s. 8d. in the pound. This is only a surmise as to intention; but if it should prove correct, the detrimental influence on industry and finance will be something appalling. At the moment, only anticipating the smaller of the two evils, all this taxation tends to make investment of savings—large and small—in joint-stock enterprise more and more unattractive; and, in exact proportion as it does this, so commercial enterprise and industry in this country are injured, and the country itself suffers.

Then there is the tax on motor vehicles and petrol. Here, perhaps, the gas industry has some small reason for congratulation. The motor waggons that are being increasingly used by gas-works for carriage about their districts are—being trade vehicles—exempt from the additional tax; and they will come under the remission for such vehicles of half of the tax on petrol of 3d. per gallon—that is to say, it will be 1½d. per gallon. There is not the slightest doubt, however, that even the 1½d. tax on petrol for these heavy class vehicles will cause a slackening in the rate of their adoption, until anyway improvements are made that will allow the use of a substitute for petrol. Already some of the heavy motor cars are fitted with carburettors capable of using petroleum; and petroleum will probably become largely the fuel for the heavy trade vehicles. The advocacy of benzol and alcohol as competitors with petrol has also been revived; and gas men will watch with keener interest than ever the trend of events under the new order of things. The Chancellor of the Exchequer estimates that the yield of the tax on motor cars and on petrol will be about £750,000; Sir John M'Donald at the road conference last week estimated that the petrol tax would, within five years, yield a revenue of £1,500,000.

These are only estimates; but about them the most interesting point is the proposal to set aside from the income £600,000 a year as a subsidy for main road maintenance. There has been so much complaint about the nuisance and damage caused by the fast moving private motor cars that some time ago the members of the Royal Automobile Club, and we believe of other clubs, announced their readiness to be reasonably taxed for the particular purpose of improving the roads, in view of the changed conditions of traffic. But, now that the taxes have come, it is thought the Chancellor of the Exchequer has taken an undue advantage of the suggestion. However, the Bucks County Surveyor calculates that the £600,000 that is to be set aside from the revenue derived from the new motor car and petrol taxes will just about cover the tar painting of the rural main roads of the country. "It's an ill wind that blows nobody good." Under this particular head, gas managements will not feel disposed to quarrel with Mr. Lloyd George, if the taxes in question mean a freer consumption of their tar for road purposes.

Suction Gas Competition.

"MAN, know thyself," is a good injunction that can be extended to many of the affairs of business life. "Man, know "thy business," is a sensible adaptation of the precept; and "man, know thy competitors in business," is another. A man does not know his business thoroughly unless he at the same time knows all about the advantages and disadvantages of his competitors. There are a few generous souls in the gas industry who say that suction gas and electricity have come to stay, and that the best thing the gas manager can do is to leave them alone, and let them do their best or worst on their own merits, while town gas should do the same. There is a big mistake here; and those who pledge their actions to such lines will find that they are their own enemies. Suction gas is at the moment the competitor in view; and there are those who are interested in suction-gas plant who do not hesitate—the personal experience is the common one—to decry town gas to manufacturers. They know full well which strings to play upon in connection with town gas, and which to leave untouched, in gaining the ear of the manufacturers, and possibly in persuading them to forsake town gas and turn to suction gas. The cognate knowledge—knowledge as to the advantages and disadvantages of the suction-gas plant—should be in the possession of the town gas man; otherwise he is placed in an inferior position in the contest for the power business. But we are enjoined by some not to talk of the frailties of the suction-gas competitor, as in such talk are the incitants to a quickening of the competition. The gas industry need not be afraid of that; and no man should be so generously inclined as to aid and abet the competitor in winning custom by assisting vendors of these plants in keeping dark its disadvantages in use. The old-fashioned notion that if one cannot speak well of a rival for business, then say nothing about its weak points, does not fit these competitive days when it is every business man's interest—so long as he does it fairly and honestly—to make the best of his opportunities.

The lecture published in last week's "JOURNAL," delivered by Mr. Henry O'Connor to the Western District of the Scottish Junior Association, is one that is timely; and it should be the means, through the practical points and research incorporated in it, of arousing a general determination to get at the actual performances of the rival as contrasted with the claims made on its behalf—claims that in the matter of cost alone (without any of the collateral

expenses and disadvantages being brought into the calculation) are put into direct comparison with town gas. These claims are widely disseminated by the makers of suction-gas plants, whose primary business is the manufacture of gas-engines; and their statements are in brief that so much saving can be effected on the town-gas bill for power by adopting their plants. The engine makers are pleased enough to enjoy the substantial pickings that the gas industry puts in their way. But in the propagation of their own business, they have step by step destroyed all outward or visible association with the gas industry. In such advertising and exhibiting as they now indulge in, they give prominence to the suction-gas plant, and assert the combination to be preferable. This should not be. The gas industry has done its part—and it has been a large part—in establishing the gas-engine makers; and the gas-engine makers should not now divorce themselves so completely from the gas industry, which is shaping itself more than ever to meet the requirements of power users. Perhaps they will in time again give evidence of a desire to work for the mutual advantage of themselves and the gas industry, as well as prosecute the business in suction-gas and power combinations. They know full well that the gas industry cannot do without them; but they evince no outward inclination to be helpful to the gas industry. We will not discuss the reason. It is so obvious as not to need discussion. But the knowledge as to the drawbacks of suction-gas plants is cumulative, and use must be made of it in defence of town gas. Some of the knowledge is to be found in Mr. O'Connor's lecture.

Credit, however, can be given to suction-gas plant for having shaken the gas industry into a more enlightened recognition of the potentialities of the power business, and what must be done to cultivate it. In a majority of places, gas at the old prices was entirely out of the question for power; and we have the evidence of towns where low gas prices exist for day power and industrial uses, of the suction-gas plant makers finding their pleadings for business there altogether unavailing. Mr. O'Connor gives some sound reasons why gas can be supplied during the daytime for this class of business at prices below the ordinary without detriment, but with benefit, to the lighting consumer. He shows, too, wherein town gas, not of the richer varieties (because, as Professor Hopkinson has demonstrated, there is a difficulty with the higher grades of rich gas in getting a proper and speedy admixture with the air), is the superior in many points of suction gas; he describes the causes of the losses there are between the working efficiency of an engine when running on town gas and when running on suction gas; he also mentions the time loss in starting up, as well as the losses necessitated by intermittent running. These are not the matters that are brought to the notice of power-gas users by the suction-gas plant makers; but they are as important to the user as—if not more important than—the fuel costs per brake horse power. The universal remedy for the delay in starting up is not such a simple matter as was suggested in the discussion of Mr. O'Connor's lecture, or else the makers of the plant would not, with such a modest remedy at hand, allow point to be given to the rival town gas by not making provision for that remedy, nor would there be so much need for the provision of a town-gas stand-by, except for emergency use. This question of the provision of a stand-by is a somewhat serious one for gas suppliers. The Edinburgh Gas Commissioners have ensured themselves against partial loss by refusing to supply meters for town gas where suction-gas plant is installed; the consumer having to provide his own meter. In Glasgow, there are so many stand-by meters that the Gas Committee have had to make a special charge for them. The hint might be taken by others, until Parliament gives power to gas suppliers, as Parliament gives power to electricity suppliers, to cover themselves, on the expenditure involved in making the provision, by a charge on those deriving advantage from having the stand-by. In the Mountain Ash Gas Bill this session, the Local Legislation Committee of the Commons have passed a clause empowering such a charge to be made; and it is hoped that the clause will stand through the remaining stages of the measure, and that there will be no difficulty in future in obtaining such power.

We will not traverse the whole of the points of Mr. O'Connor's lecture. It has been before our readers for a week; and many have, without doubt, derived not only interest but instruction from it. It emphasizes our first submission, that as much as possible should be learned by gas men of the weak side of suction-gas plants, so as to assist town gas in the competition for power business. The question alone of cost per brake horse power with such gas plant has a seductive influence. It appealed to at least three Glasgow manufacturers, whose plants have now been cleared away and town gas substituted. This was done because the plants were not reliable. It is an advantage of town gas that it is reliable, that its composition is approximately uniform, that it is always available, and that there are no starting-up or breakdown losses, nor losses due to intermittent working.

Influence of Surface upon Gaseous Combustion.

Pressure of time between the receipt and printing in our columns of the reported lecture delivered by Dr. W. A. Bone, of the Leeds University, to the North of England Gas Managers' Association, on Saturday, prevents any proper examination of the subject being made in the present issue; and, as a matter of fact, effectual criticism and comment on such a topic as the "Influence of Surface upon Gaseous "Combustion" could only be made by a peer of the learned lecturer in the realms of science, and moreover by one who had conducted investigation along the same intricate paths. Accompanied by all the detail that is necessarily incorporated in, and is in fact a part of, such a question as this, the subject appears to the layman to be one of great complexity; but it is quite easy to get at the central idea of the lines of research that Dr. Bone has set his hand to by, in effect, reproducing from his deliverance certain definite statements. And having grasped the meaning of these, it will be all the easier for those engaged in the daily work of gas manufacture and use to appreciate the lines on which Dr. Bone is pursuing inquiry, simultaneously with certain Continental contemporaries, into this matter, and which inquiry must, we have no hesitation in believing, have in its results great practical value.

It is a somewhat singular fact that this subject of the influence of surface upon gaseous combustion has remained so long an unattractive field of research to physicists and chemists, though from the pursuit of a correct understanding of such influence should, the practical mind realizes, ensure valuable effects. As far back as the period between 1816 and 1836, it was established that all solids have the power of accelerating combustion under suitable conditions; but the work of that period was confined within very narrow bounds. And it is only really within the last dozen years or so there has been a revival of the study, with the object of revealing that which the earlier investigators had left latent. We know the part that Professor Bone has taken, and is taking, in this and kindred investigation; and the gas profession are proud of their closer association than has hitherto obtained with the aims of one who seeks to point out the way to greater practical utility by his own exploration in the higher spheres of science. In the lecture he delivered before the Institution last year, Dr. Bone indicated how surface accelerates the decomposition of methane when at high temperature; and he also pointed out the function of the charge in retorts, of the hot tar, and the heat of the walls of the retort, in promoting decomposition of methane into carbon and hydrogen. But in the present lecture we go into the influences of the heated surfaces of solid bodies in promoting combustion. To paraphrase Dr. Bone's own statement, when we consider the number of industrial operations which are more or less necessarily conducted in furnaces enclosed or bounded by solid walls, and also more or less packed by solid materials, the importance is at once seen of the influence of hot solids; and, though often overlooked, that importance can hardly be over-estimated in dealing with the applications of gas for heating purposes.

The work in the early part of last century shows the long existence of the recognition of the marked influence of heated surfaces in accelerating not only combustion, but chemical interchanges in gas generally; and this brings us to the cardinal points that Dr. Bone sought to convey on Saturday to the gas engineers who were privileged to hear him. Consider that in a flame certain chemical changes are proceeding, and that these chemical changes are slow compared with what might be produced under suitable conditions. Appreciating this, it will be seen that there may be scope for accelerating action, and consequently of promoting the heating efficiency of the gas, if a substance can be found to accelerate combustion. A hot surface accelerates certain chemical changes in the gas, which changes would otherwise be slow. Therefore,

If we have a mixture in process of combination brought into contact with a nearly red-hot heated surface, combustion takes place with greater rapidity in the neighbourhood of the solid than away from it, heat is developed at that surface more rapidly, and thus a greater intensity is achieved. In short, "the function of the surface is to render one or other of the "gases active by loosening or dissolving the bonds which "hold the atoms in the molecule together; so rendering it "an easy prey to the action of the other gases." In these points as extracted from the lecture is the starting-point of Dr. Bone's researches—already partly prosecuted, and still to be continued, until more that is definite has been acquired. The main objective in his view—opposed to Mr. Frederick Siemens's radiation theory in the matter of the proper heating of furnaces—is to get the greatest efficiency out of heating by gas by inducing as much surface combustion as possible, by getting the combination of the gas to take place, as far as possible, at the actual contact with the hot surface.

To the more practical side of the question. Experiments are being conducted by Dr. Bone into many materials, to find out the various degrees of action exerted by them in promoting surface combustion; and he is carrying the same line of research to the incandescent mantle. It can readily be appreciated how such knowledge as this may be of considerable value in all forms of heating in which combustion of gases occurs in enclosed places such as furnaces, in gas-fires, and so forth. It is a small matter; but perhaps in what Dr. Bone now puts before us, there is the explanation of the increased illuminating power given by mantles when the supporting prop is fitted by one of the Cash-Eady fire-clay cones (described in the "JOURNAL" for July 14 of last year), which, when the cone becomes heated, possibly has the described effect of accelerating surface combustion and promoting heating intensity. The gas engineers who heard the lecture on Saturday were instructed; but they recognized that Dr. Bone had a large portion of the field before him still to explore. Further, they also recognized more than ever the inestimable value of the association of science and practical work. There are few—perhaps there is no one—directly concerned in the practical work of the gas industry qualified, in such matters as this, to bring to light the value that still lies hidden in the unexplored and unknown. By every fresh effort of those scientifically associated with our industry, the truth of this becomes the more deeply impressed upon the practical mind.

The Public Utility of Tar.

THE appreciation of tar not as yet in market value, but as a useful material for a purpose of public utility, without any particular encouraging efforts being put forth by gas managers, is an experience both gratifying and novel. Significant indeed is the amount of attention that is being given to the utilization of this plentiful product of coal carbonization by those whose business it is to construct and maintain roads, and by those who use them for mechanical locomotion. The British Road Conference held in London last week was attended by men influential in several directions—socially, in local government, and as chief officials to the authorities in whom reposes the responsibility of the maintenance of our highways and byways generally. Of the forty papers presented to the conference, something like one-fourth introduced, in greater or less degree, the question of the use of tar, either in the construction of roads, or for their top dressing; and it may be said that the technical testimony, as well as that of the users of the roads, was favourable to the greater employment of the commodity which the gas industry will be pleased enough to supply. It was the dust nuisance which raised public clamour against the motor car. Both this and the mud nuisance motorists are equally pleased to see allayed; and for both these desirable ends, as well as the better maintenance of roads, the responsible authorities and their officials devoutly wish.

Tar is voted by the great majority of road experts to be the specific for both nuisances, and the best road preservative. The formerly approved form of constructing macadamized roads is no longer approved. It is defective under the new traffic conditions; and the specification for a road now is that, while it must be of sufficient strength, it must also be impervious to moisture and be practically mudless and dustless. In the construction of roads, the experts agree that tar is the best binding material. But we fail to see that there is any need to go to the expense of adopting any costly form of patented tar macadam. Road authorities have quite sufficient work to carry out in the way of road construction and repairs to be their own producers of macadam, using tar as a binder. The costs quoted in the papers, however, show that the expenditure for this form of construction is prohibitive, except for main thoroughfares through urban districts. On the other hand, there are no two opinions as to tar macadam being preferable to a simple top dressing; but no justification can be submitted for the expense of the former save in special situations. In all situations, therefore, where expense will not allow of tar macadam, the surface dressing by tar is praised and commended as effective, not only for minimizing the nuisances of dust and mud, but for preserving the road. Controversy is very keen, however, as to the relative benefits of tar spraying and hand work. Generally speaking, spraying is found the cheaper method; hand work the more durable. In different districts, however, experiences vary as to costs in a somewhat remarkable manner. In one of the papers presented at the conference, it is seen that spraying, in the West Riding of York, worked out to $\frac{7}{8}$d. per superficial yard; and adding the cost of sweeping and sanding, the total was 1$\frac{1}{2}$d. In another paper, dealing with Glamorgan, the cost of two coatings of tar by hand, including sanding, came out to just under 1d.; while tar spraying cost $\frac{3}{4}$d. per yard for two coatings. There is not much difference between the cost of handwork in Glamorgan and spraying in Yorkshire, and between the two systems in Glamorgan; but the hand work is found to be the more lasting. Where, however, the cost of spraying is found to be less, it can be done more frequently, without increasing the cost over hand labour, besides which there are to be taken into account rapidity and the reduced time-obstruction to the use of the road. In saying this, it is merely to point to the advantages and disadvantages of the two systems; but we would urge that, if the conditions permit, for the sake of the employment, recourse should be had to manual labour.

There is another point of which sight should not be lost; and it is that the cost of surface dressing ought not to be put entirely to the account of the suppression of the dust and mud nuisances. Mr. F. G. Carpenter, in dealing with experiences in the West Riding of York, asserts that the treatment of roads by spraying prolongs their life by about 20 per cent.; while Mr. H. E. Stilgoe, the City Engineer and Surveyor of Birmingham, avers that the top dressing lessens wear and tear, prevents damage by the suction of pneumatic tyres, and generally increases the life of the road. Therefore, a proportion of the cost ought fairly to be placed to maintenance. These are all interesting points. The conference should give a fillip to the application of tar for these purposes; and the decision of the Government to allocate the major part of the new taxes on motor cars and petrol to road maintenance should also have an effect in the same direction.

Manchester and the Rates

As was more than half feared would be the case, the Manchester Corporation Gas Committee have yielded to pressure brought to bear upon them, and have consented to increase their contribution to the city fund for the present year from the figure of £26,495 at which they originally fixed it, to the (for them) more usual sum of £50,000. This, however, it must be noted, can only be done by adopting the expedient of "anticipating profits"—which is apparently the course selected in preference to raising the price of gas. While a week ago it appeared that the citizens would be called upon to pay increased rates to the extent of over 6d. in the pound, the careful revision that has since taken place—together with the further call on the trading departments—has brought the increase down to practically 3$\frac{1}{4}$d., which, as is remarked in our news columns, is roughly the amount needed for the Ship Canal. With regard to this revision, it may be here pointed out that the additional contribution now arranged to be given by the Gas Committee is equivalent to a rate of 1$\frac{1}{4}$d. in the pound. So far, the discussion that has taken place in the city on this vexed question of the rates has been mainly among the different Committees and by the ratepayers themselves. The final words of the Council on the whole subject are still to be uttered; and it will be surprising if a good deal more is not heard from that direction. In fact, the following remarks in a local paper are highly significant: "Apart from the state of

public opinion in regard to the rates on the present occasion, the Finance Committee now fully realize that if the rates are to be kept within reasonable limits a check will have to be placed on certain departments. There is reason to believe that in the report which the Committee will present to the Council certain recommendations of a drastic nature will be made. In unofficial quarters there is some talk again of the desirability of appointing an Advisory Committee; but whether any suggestion bearing on the matter will be made to the Council is not known." Whether the Finance Committee have been longer than should have been the case in realizing what they realize now, or whether they ever would have done so but for the public outcry that has been raised, need not be inquired into too closely by the citizens. More solid gratification will be derived by them from the thought that now, at all events, a really serious attempt is to be made to grapple effectively with "the question of the rates."

Gas Matters in Birmingham—The Accounts.

The report and accounts of the Birmingham Corporation Gas Committee for the twelve months ended March 31 last, which are noticed in another column to-day, contain several points of interest in regard to what the Committee point out is "the largest commercial department of the Corporation, and the largest gas undertaking in the Provinces." The period was one of bad trade generally; and therefore, Birmingham being a manufacturing centre, the ratepayers will have been expecting to learn that there was some falling off in the quantity of gas sold. It must be a gratification to them under these circumstances to find that the amount sold and used on works was 6978 million feet, as compared with 7042 millions in the preceding year, which represents a drop of less than 1 per cent. Even this slight reduction has not been reflected in the surplus profit, which constitutes a record; the amount being £71,459, as compared with £61,313 the previous year. In addition to this sum, which is handed over to the Finance Committee in aid of the improvement rate of the city, the department contribute various other amounts for public purposes; the improvement rate also benefiting to the extent of £4000 interest on the reserve fund, while £15,440 is put down as "in aid of public and court lighting"—making a total of £90,890. Looking at the revenue account, it is seen that the receipts came to £935,636, compared with £980,089 the year before; while the expenditure was £745,335, as against £800,126. Thus the decrease in expenditure was over £10,000 more than the falling off in the receipts—which is an eminently satisfactory state of affairs.

The Committee's Report.

Turning to the Committee's report, it will be noted first of all that No. 2 retort-house at the Adderley Street works is under reconstruction, and that it is intended to instal therein the Fiddes-Aldridge charging and drawing machine. Next comes an interesting statement under the heading of distribution—namely, that the Committee have arranged to lay down a trunk main that will be worked at a pressure of about 2 lbs. to the square inch, with off-takes at various points, where the pressure, regulated by governors, will be reduced so as to maintain the supply at the normal or required pressure to the premises of consumers; and, in laying down the system, the route of the main will be arranged so as to supply gas at high pressure for public lighting along the main streets in the centre of the city. The streets that will in the first instance be served by the main are enumerated; and the estimated cost of the scheme is given at £15,000. Birmingham has for some time past enjoyed the benefit of an excellent high-pressure gas installation in the neighbourhood of the Council House; and it is not surprising to find that there is a desire to grant a similar boon to other of the leading thoroughfares. A considerable portion of the report is devoted to the subject of organization; reference being first made to the appointment twelve months ago of the Engineers of the various works to the more responsible position of Engineers-in-Charge. It is stated that the system then inaugurated has worked so smoothly and well that the Committee are unanimous in their opinion that its continuance is in the best interests of the undertaking; and the Council are recommended to fix a maximum salary for the Engineers-in-Charge of £1000 a year. Mr. G. Hampton Barber, who is at present Secretary of the department, the Committee recommend should be appointed Secretary and Manager of the undertaking, with a maximum salary of £2000 a year. The Committee propose forthwith to increase his remuneration from £1400 to £1600 per annum. But the amount will not permanently remain at this figure; for the only conditions to further advances within the maximum named are Mr. Hampton Barber's "continued efficiency and the prosperity of the undertaking."

Free Gas for Public Purposes.

Our researches into the question of the legality of the use of free gas for the purposes of lighting the streets and public buildings of Oldham were naturally limited to the records available, and the remarks made on this point last week were put forward tentatively in the hope of drawing further information. There has since been an opportunity of seeing what occurred in 1865, when the Corporation obtained an Act, in which the right was given to use gas for the "public advantage." That power for more reasons than one ought to have been explicitly determined when the limitation of profits was imposed in the Act of 1886. In the first place, though the Council do not appropriate in actual money more than the amount to which they are entitled under the 1886 Act, they are, by taking advantage of the 1865 provision to an extent only limited by requirement, setting at naught the profit limitation imposed by the Act of 1886. Gas costs money; and it represents money. Moreover, there is a vast difference between the quantity of gas that is used now for public purposes and the quantity that was used in 1865. The quantity consumed now in this way, and the burden of which the gas-consuming section of the ratepayers alone has to bear, could never have been contemplated in 1865. In effect, this taking of free gas for public purposes to such extent as now, detracts from the value of the limitation clause of 1886. It is to be hoped that Parliament will say that what the Corporation are now doing in this regard is in excess of the powers given by this clause.

The Out-Districts and Free Gas.

There is another point. In 1886, Parliament ordained that the charge for gas outside the borough to ordinary consumers should be the same as the charge for the time being within. Now this abolition of the differential charge is in a measure defeated by the use of free gas by the Corporation within the borough. The consumers generally have to pay for this free gas. The consumers outside Oldham, therefore, pay their share of the cost of the gas used free in Oldham, and they also have to pay (as ratepayers) their share of the gas used for the public lighting of their own areas. The differential prices may have been abolished; but differential positions have been maintained, through this unjustifiable appropriation of gas on the part of Oldham. The out-districts are now asking Parliament for the repeal of the power in the 1865 Act, as being, to all intents and purposes, a violation of the profit limitation clause of 1886. We are not, however, so much concerned about the out-districts, as for the consumers generally, who we consider are inequitably treated through having to pay for this free gas for public purposes, as compared with those ratepayers who are not gas consumers. Equity demands that the cost of all public services shall be borne proportionately.

The Disturbed South Wales Area.

The masters and men in the South Wales coal-field seem to be no nearer a settlement of the dispute that has arisen as to whether or not the coming into force of the new Eight-Hours Act will automatically terminate the wages agreement which, under ordinary conditions, would remain in operation until March 31 next. Each side has sought Counsel's opinion; and these opinions are diametrically opposed. The employers have consulted Sir Robert Finlay, K.C., Mr. Eldon Bankes, K.C., and Mr. Montagu Lush, K.C.; and they all expressed the view that the Act would terminate the agreement. The workmen's representatives, on the other hand, contend that they have a mandate from the general conference of South Wales to brook no interference with the wages agreement until it has run its normal course; and they are not prepared to submit to any modification of the agreement unless the change is universal throughout the Welsh and English coalfields, inasmuch as the Act operates in both coalfields in precisely the same manner. The owners suggested, at a meeting of the Conciliation Board which was held last week, that the Solicitors on both sides should prepare a joint case to be sub-

mitted to one of the Law Lords or to a Judge of the High Court, to be selected by the Lord Chief Justice; and while the men's representatives promised to consider this, they put forward a counter-proposal that a Joint Sub-Committee of the Conciliation Board should settle the points in dispute. Though it is much too early to say definitely that the long-feared struggle will be obviated, these suggestions seem to give at any rate some promise that a peaceful solution of the difficulty may be ultimately arrived at.

The Law and Reckless and Dishonest Speculation.

The Attorney-General (Sir W. S. Robson, K.C.) is not enamoured of the position of company law. There has been a lot of consolidation, patching up, and extension of the law relating to companies; but, in the Attorney-General's view, there has not been amendment. This is a serious reflection on our Legislature; but it is still more serious to hear of the facility with which company law can be made to serve the purposes of fraud. At the annual meeting of the Bar, Sir W. Robson made some pointed remarks on the subject; and it is not unlikely that, in his official capacity, he has been indulging in a fairly broad survey of the fields in which the malversation of a certain type of company promoter has play. An attempt, he says, will have to be made to deal with this question of the company law serving the purpose of fraud. The sooner the attempt is made, the better; for the difficulties are great, and the longer there is delay in facing the situation with deliberation, the worse it will become. Fraud seems to betray a fondness for corporate form; and in corporate or co-operative companies it is rampant. "We are," said Sir William, "all anxious to bring reckless and dishonest speculation within the purview of either the civil or the criminal law." The sooner that anxiety shows expression in deed, the earlier will there be greater hope of the community being protected from the parasites who commit the frauds that the Attorney-General had in mind.

An Unpromising Speculation.

The Selsey Water Company is a speculation with very little hope of success. It is a concern with little that is solid to justify existence on a big capital. We remember that when the Selsey Water Bill was before a Parliamentary Committee, the Hon. J. D. Fitzgerald, K.C., described those who were promoting the measure, or those who were in the front of the promotion, as men of straw; and it would be a bit interesting to hear what description he would apply to the business on which the Directors are now trying to raise thousands of pounds of capital. Certain it is that the learned Counsel has not risked any of his money in the concern. Almost precisely a year ago, we were calling attention to a prospectus of the Company, in which the public were asked to confide £12,000 to the Directors to supply water to the undeveloped district of Selsey, which is connected up with civilization merely by a sort of tramway ending at Chichester Station. It was wondered at the time what so much as £12,000 was required for, seeing that the Company have no pumping works to construct, but only a distribution system—the water being purchased in bulk from the Chichester Corporation. The promoters' share was doubtless for such a concern somewhat heavy; but there is no public information on that score. Nor is it known by us to what extent the public responded to the appeal for capital then made. Whatever the amount was, the Directors are again asking the public to show confidence in them and the undertaking by subscribing £5000 more in ordinary shares and £1000 in debentures of £25 each. The present prospectus states that the issue of capital is being made for the purpose of carrying out various extensions, and the laying of distributing pipes, "in order to meet the urgent demand for water supplies and for other purposes." How was the money spent that was last raised? The prospectus states that the "works" were only recently officially opened. There have been no works to construct, other than the laying of a line of 5-inch cast-iron pipes and the distribution system. A large amount of such work can be done for a very few thousand pounds when the distribution pipes are no larger than those laid at Selsey. There is room for more disclosure as to the expenditure of the capital raised before more money is sunk in this project by the public. The well-recognized bait is offered of a year's guarantee of interest; and although the prospectus was not published until towards the end of the fourth month of this year, a full six months' interest on July 1 is promised on the amounts paid. The Board is an interesting composition. There is upon it Alderman J. O. Holt, Mayor of Chichester, and Chairman of the Corporation Water Committee; Luther Clayton, Director of the Petersfield and Selsey Gas Company; Edwin R. Painter, Chairman of the Petersfield and Selsey Gas Company; and W. B. Martin, Director of the same Company. Mr. Martin has had a decent experience as a Director, including the ill-fated Amman Valley, the celebrated Laindon, and the North Pembrokeshire, New Toddington, and Cobham Companies.

THE LIVESEY MEMORIAL FUND.

We have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.			£	s.	d.
April	26	Previously acknowledged	9151	6	1
	28	Thomas A. Guyatt, Ely	1	1	0
	29	Herbert Lees, Hexham	2	2	0
		Long Eaton Gas Company	5	5	0
May	1	Charles Wood, Bradford	5	5	0
	3	John Hughes, West Kirby		10	6
		Total	£9165	9	7

PERSONAL.

Mr. Lewis Mitchell, M.Inst.C.E., has been appointed Engineer of the Bolton Corporation Water-Works Department, at a salary of £500 per annum. Mr. Mitchell was Joint Engineer for the Bolton Corporation with the late Mr. R. H. Swindlehurst.

Mr. R. S. Gardiner, who has for many years had considerable experience in connection with foreign gas undertakings, and, as our readers are aware, is a member of the Committee of the Société Technique de l'Industrie du Gaz en France, has been elected a Director of the European Gas Company, Limited, in the place of Mr. E. F. White, who has resigned through ill-health after being on the Board for upwards of thirty years. Mr. Gardiner, it may be remembered, recently received the decoration of the Legion of Honour.

Those of our readers who are acquainted with the gas undertakings in the eastern counties are probably aware that the gas-works at Sudbury were held on lease by Mr. C. W. Grimwood, who had been connected with them since 1868, in which year he took charge of the office work for Mr. R. A. Starke, of Woolwich the then lessee. He became lessee in 1881. On the expiration of the lease a short time ago, the Gas Company decided to carry on the works themselves; and they appointed Mr. C. G. Grimwood (Mr. Grimwood's son) Manager and Secretary. His immediate predecessor in the latter office was Mr. H. Bridgman, who recently resigned on account of failing health. The Company was formed in 1836; and the first Secretary was Mr. J. F. S. Gooday, father of the present General Manager of the Great Eastern Railway Company.

OBITUARY.

The death occurred on Saturday, the 24th ult., after a fortnight's illness, of Mr. J. Walker, who for many years had held the position of Manager of the Budleigh Salterton Gas-Works. He was greatly respected by all with whom he was associated; and the Directors of the Gas Company always regarded him as a valuable and capable servant. He leaves a widow and an only daughter, for whom much sympathy is felt.

The "Journal für Gasbeleuchtung" of the 1st inst. reports the death, on the 16th of April, of Herr Karl Volbehr, who retired in 1899 from the position of Manager of the Hamburg gas undertaking. Deceased was born at Kiel in 1838. After experience at the gas-works in that town and in Ansbach and Bâle, he was appointed in 1864 Assistant to Herr J. H. Schilling, the State Inspector of Lighting at Hamburg, on whose death a few months later he was promoted to the inspectorship. When the gas-works passed in 1892 into the hands of the State of Hamburg, he was appointed Manager. Since his retirement, enforced by ill-health, he had resided in the neighbourhood of Berlin.

We are informed by the Hon. Secretary (Mr. Octavius Thomas) that the half-yearly meeting of the Wales and Monmouthshire District Institution of Gas Engineers and Managers, instead of taking place at Barry to-morrow, has been postponed until Wednesday, the 19th inst.

Alderman Leonard Wild, ex-Chairman of the Bolton Corporation Gas Committee, and Mrs. Wild celebrated their diamond wedding on Saturday. Before he retired from business a few years ago, Alderman Wild was one of the best-known figures on the Manchester Royal Exchange.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 324.)

THE week just closed was not a very active nor a particularly exciting one on the Stock Exchange. It was a short one (the Exchange being closed on Saturday; and it was account week, with its attendant settlement, which was not a formidable affair. Movements were very irregular and variable, up and down in the course of the day; the advances of the morning being often seized for realizing in the afternoon. Budget considerations were a factor on the closing day, and influenced special lines. Thus, petrol-using cars were flat, but competing electric rails were strong. The tone at the opening on Monday was calm, business was fairly active, and most markets held firm. But some of the best gilt-edged were rather shaky, and Consols fell $\frac{1}{16}$. The Foreign Market was firm. Business fell much quieter on Tuesday, and movements were slight and irregular. Wednesday was a long time getting into swing. It afterwards developed firmness; and the leading markets closed quite strong. This attitude continued through the early part of Thursday; but business became dull, and realizations brought prices down. Friday was to a great extent a repetition of the preceding day—things moved up and then down again. Consols, however, closed unchanged. In the Money Market, the pronounced condition of ease was continued, though the requirements for the Stock Exchange settlement and for the month-end caused a better demand at the close. Business in the Gas Market was, on the whole, reduced in volume; but there was considerable activity in Argentine undertakings in view of the prospect of a fusion of interests. These scored further improvements in quotation; and the general tendency all round was good. In Gaslight and Coke, the ordinary was quieter at unchanged figures; transactions ranging from 103 to 104. The secured issues were steady—the maximum fetching 89; the preference from 105 free to 106; the debenture 85 and 85⅝. South Metropolitan was not active, but was inclined to rise, changing hands at prices ranging from 123⅞ to 124½. The debenture marked 85¾. Commercials were very quiet; only the 4 per cent. showing any business, and fetching from 107 to 109. The Suburban and Provincial group were not much in evidence. Alliance and Dublin old was done at 17¾, British at 42½, Portsea "A" at 138, and West Ham at from 119½ to 120½. On the local Exchanges, Liverpool "A" recovered its lost points; but Sheffield "B" lost 2. The Continental companies were remarkably inactive. The one transaction in Imperial was at 185 (a rise of ½), ditto debenture was done at 96 and 96½, and European fully-paid at 24 and 24¼. Among the undertakings of the remoter world, Buenos Ayres changed hands at from 13⅞ to 14⅛ (a rise of ½), both Melbournes at 101, Monte Video at from 12⅜ to 12⅝, Oriental at 14½, Primitiva at from 7 to 7¼ (a rise of ½), and River Plate at from 15 to 15½ *cum div.*, and from 14⅜ to 14¾ *ex div.*

ELECTRICITY SUPPLY MEMORANDA.

The New Charter of the Electric Industry—Some of the Proposals—Compulsory Land Powers—Municipal Pettiness—An Instance from Bath—Crude School Lighting Tests.

THE electricity industry badly wants the Electric Lighting Acts (Amendment) Bill. They have attributed much of their ill-fortune to the operation of the existing General Electric Lighting Acts, and to the difficulties created by them. The new Bill is expected, when passed, to remedy many of the disabilities under which the industry is supposed to have been labouring through the want of foresight on the part of Parliament in the early days of general electricity supply. The healing measure has, however, been on the carpet, and then has been packed away again, in so many sessions that those who earnestly desire its existence as a positive instrument of usefulness have abandoned all signs of delight at seeing it again in its initial stages, and are now reserving their pæans until the measure can actually be called an Act, and so have effect. The Bill, as has been stated before in the "JOURNAL," has been brought forward again this session; and it was seriously discussed in the House of Lords on Tuesday night. One object of the measure is to confer greater dispensatory powers on the Board of Trade; and to enable promoters to get through the Board certain powers that at present can only be obtained by a Bill. The present practice is that promoters are not allowed to proceed by Bill for electricity powers in cases where they can do so by Provisional Order. There are cases, however, in which promoters are obliged to proceed by Bill, because they are seeking for powers (such as to purchase land compulsorily, or to supply energy in bulk) which the Board of Trade cannot confer under the present Acts. The Bill in part gives effect to certain recommendations of a Joint Committee of 1908; and the remaining clauses are intended to either generalize provisions usually inserted in Local Acts dealing with electric supply, or to remove further difficulty that has been experienced in the working of the Electric Lighting Acts.

The Bill indeed will, on being passed, give very wide additional powers to the Board as to granting authorization for compulsory acquisition of land for generating-stations, for supply in bulk, for supply to premises outside the area of supply, and for the formation of Joint Boards for electricity supply. Among the more general matters are provisions for the revision of the maximum price, for certification of meters, and protection to undertakers in the matter of stand-by supplies where private plant exists. There is, too, the power (similar to the new model clause) regarding the provision of fittings, whereby the fittings business is to be separately treated, and be made to pay for itself. There is also a clause which gives exemption from stamp duty to agreements for the supply of electricity; and other matters are dealt with. Regarding two or three of these latter points, and first as to the certification of meters, this is good so far as it goes; but in the interests of electricity consumers, the more stringent and compulsory provisions of the Sales of Gas Act should be applied. While gas men would like to see electricity undertakings put on a level with gas legislation in this regard, they would also like to see their own undertakings put on a level with electricity concerns in respect of stand-by supplies. The model clause for the fittings business already applies to both gas and electricity undertakings now seeking powers in this respect, with the limitations proposed in the Bill. Electric lighting contractors are, however, anything but satisfied to find that in the Bill the Board of Trade are not proposing a form of clause that makes it compulsory in the case of municipal undertakings to do the work through them.

The land powers in the Bill are looked upon as very important; and they received the principal attention in the discussion in the House of Lords. The clause proposed to give the Board of Trade unconditional rights to authorize the compulsory acquisition of any land for the purpose of a generating station, whether or not the land was situated within or outside the area of the electricity undertaking. When the measure was previously under discussion, there was opposition on the part of the Gas Companies' Protection Association and the London Gas Companies; and the result was the protection from compulsory acquisition under the measure of land "which, at the date of the first publication of the notice for the Order, belongs to any gas undertakers, and is used or authorized to be used by them for the purposes of their undertaking." Beyond this, on the motion of Lord Balfour, the powers of the Board have been further restricted by adding to the land clause provisions making the purchase procedure more in accord with that affecting gas-works. Lord Balfour's addition provides that it is not to be lawful for any undertakers, except with the consent of the Board, to construct any generating-station on land acquired by them unless the construction is authorized, and the land is specified, in a Special Act or Provisional Order; and the Board are not in any case to give consent until notice has been given by advertisement or otherwise (as the Board may direct) to owners and lessees of land situate within 300 yards of the land on which the generating station is to be constructed. The 300 yards radius already under the Standing Orders applies to gas-works. As Lord Balfour says, a generating station is not altogether a thing of beauty, but "an evil in almost any district." It might come under the category of those things which are necessary evils, which must be endured if they cannot be got rid of. At present the chief remedy is the law of nuisance; but that is not satisfactory, because it takes no account of amenity, which is important in some districts. It is possible to quote several instances where generating-stations have been put up in close proximity to buildings, which would have been much better without their new neighbours. There was an attempt made by Lord Avebury when considering the question of the auditing of electric companies' accounts, to make the section applicable to the accounts of local authorities, in view of the strong impression abroad that local authorities do not make proper provision for depreciation and reserve. There was no doubt Lord Avebury would have carried the House with him; but he was strongly pressed, through the mouthpieces of the Government, to withdraw the proposal. This he did on Lord Hamilton of Dalzell, who was in charge of the measure, saying the Government were anxious to secure an efficient audit, and he would be glad to consult with Lord Avebury before the next stage of the Bill. These are some of the interesting points of the measure, and of its present position. Whether it will be more fortunate this year than in previous ones, no one cares to predict.

There is a fresh development from municipal trading in electricity supply; and the worst of it is that it is a development showing an amount of deterioration of the dignity of municipal councils, with a simultaneous growth of petty behaviour that would be highly amusing were it not a matter to be deplored. Can anyone conceive of any municipal department, not many years ago, being so paltry as to give instructions that the advertisements of a gas company were not to be received for the backs of tramway tickets, because such advertisements were detrimental to the interests of the municipal undertakings? Yet such a thing actually happened in one of our London suburbs not long since. One hardly knows how to find expression suitable for such stupidity and little mindedness. A tramway run under the administration of a local authority is a public possession for the public convenience; and there ought to be no preference given to local advertisers who are prepared to pay for the advertising facility offered by the tram-tickets, or for the matter of that in the cars themselves. Another piece of paltry action is found in the report of a recent meeting of the Bath City Council. The Corporation own the electric lighting undertaking. Just recently they were hoping they would get rid of the wretched nightmare to the Somerset and District Electric Power Company. But the parties were buffeted from pillar to post over the matter; and at

every turn an unclimbable obstacle was found in the path. That, however, is not pertinent to the question of the growth of petty action among municipal authorities as a result of trading in electricity. The lighting of Victoria Park at Bath is required on the three nights during the thirteen summer weeks when the band is playing. The Electric Lighting Committee made an offer to the Park Committee to supply and light 38 100-candle power lamps for 2s. an hour if the Park Committee paid a sum of upwards of £600 to meet the first outlay for mains, lamps, &c. Subsequently a revised offer from the Electricity Committee quoted an inclusive sum of £60 per annum. The Gas Company's offer was an inclusive charge of £40 per annum to light 35 250-candle power lamps for two hours per night and for three nights weekly for the thirteen weeks of the season; and for any extra nights a charge of 6s. per night.

Those are the facts; and here comes in the childlike behaviour on the part of the ruling authority—in 1909—of the ancient and historical city of Bath. The Corporate Property Committee offered the Park Committee a grant of £60 per annum if electricity were used. But the Park Committee, in the interests of the ratepayers, preferred the £40 tender of the Gas Company, thus saving £20 a year; and the 8750-candle power they offered as compared with the 3800-candle power of the Electricity Committee. The Committee therefore reported that a grant £20 less than had been suggested on behalf of the Council would suffice. Certain of the members of the Council (we are not acquainted with them personally, but we believe they are all adults) seriously discussed the matter in a sort of "If you do this, I won't play" spirit. Mr. Colmer, the Chairman of the Corporate Property Committee, moved the withdrawal of the recommendation as to a grant; and later on said "he did not think for a moment his Committee would recommend any grant if the park was lit with gas." Then Mr. Hatt, the Chairman of the Electric Lighting Committee, must have been violently agitated to have made such a remark as this: "If the Council, instead of supporting its own undertaking, offered a subsidy to provide another form of lighting, the Committee would be justified in considering whether it was worth while trying to make a success of the electricity undertaking." This gentleman wished to make sure that there should be no mistaking the narrow-minded views of the Council by adding to the grant-withdrawal motion "that no grant be made for any other form of illuminant." Then Dr. Preston King valiantly said: "They stood by the offer of £60; but they were not going to pay money out of the rates for gas." The end of the discussion was that because of the sin of the Park Committee in adopting lighting not involving a heavy capital expenditure, but saving the ratepayers £20 a year, and obtaining an illuminating power nearly 5000 candles greater than would have been the case by electricity at £20 more, the order went forth that the grant was not to be allowed. Can anyone imagine anything more puerile or silly from a body of men entrusted with the local government of such an important city as Bath? It shows the state of mind to which trading in electricity is bringing some of the members of our local governing bodies. Is the race of municipal councillors degenerating?

A report presented recently to the Local Government Board on the subject of the management of poor-law institutions, it will be remembered, stated that there was no sufficient justification for, where gas is installed, changing the system of lighting to electricity. Change of this kind costs a substantial sum; while the most modern thing in gas lighting can be applied to existing fittings at a comparatively small expense. The Woking School Managers have been trying a crude sort of experiment as to the relative costs of gas and electric lighting; but we strongly recommend them to carry their research a little farther than they have done, to ascertain the relative initial and annual cost of obtaining improvement by modern gas-lamps and Osram electric lamps, as well as the relative illuminating power realized for the total amount of money to be spent. We do not understand that the school managers have irrevocably pinned themselves to one system or the other; but, in a report that has been referred to the Education Committee, it is proposed that certain schools be lighted by Osram lamps and others by improved gas-burners. The only tests that have been carried out show a great advantage in favour of improved gas lighting both in cost and illuminating power. One school was lighted by four 300-candle power self-intensifying gas-lamps, three "best" lights (the description does not suggest an acquaintance with these lamps), and one inverted outside light. The running of these for twelve hours only cost 2s. 2¾d., including maintenance. At another school twelve Osram 50-candle power lamps running twelve hours cost 3s. 9d., or (say) 1s. 6d. more. But these were only giving a total illuminating power of 600 candles. On the three points of capital cost, running expense, and illuminating power, we suggest to the school managers of Woking that they have not penetrated the subject sufficiently for them to arrive at a proper conclusion.

Corrosion of Steel and Wrought-Iron Tubes.—The volume of "Proceedings" of the American Society for Testing Material contains a paper by Messrs. H. M. Stowe and Bradley Stoughton on "Corrosion of Steel and Wrought-Iron Tubes." They examined a large number of specimens, and carried out various severe tests of their own; and their opinion is that good modern steel is more resistive than wrought iron.

NOTES FROM WESTMINSTER.

THE Gaslight and Coke Bill is still "held up" by Mr. Thorne. From week to week, when the Bill has been introduced for third reading, he has formally objected, and there has been further postponement. It will again come up this evening. Whether Mr. Thorne will follow the same tactics, or put his amendment to the vote and let the House decide the fate of the measure, cannot be said. We rather think, however, Mr. Thorne is in agreement with us, that, if the matter is put to the vote, the Bill will proceed without any further hindrance. The principal matters that came before Committees of the two Houses during the past week are dealt with in the succeeding paragraphs. Fresh Committees will be meeting to-day; and among the Bills expected (at the time of writing) to be almost immediately under consideration is that of the Dublin Gas Company. The measure is well backed.

Salford Illuminating Power and Profits. The old illuminating power question is being fought with renewed vigour on the Salford Corporation Bill, which was before Lord Donoughmore's Committee during part of their sitting on Wednesday and the whole of Thursday and Friday. The Bill, as our digest of the provisions early in the year showed is (*inter alia*) for an extension of the works, further capital, and the reduction of the standard of illuminating power from 17 to 14 candles, tested in accordance with modern practice. The number and status of Counsel engaged was indicative of the importance attached by the opponents to the proposals of the Corporation. The Lancashire County Council, the Manchester and Eccles Corporations, the Salford Board of Guardians, the Swinton and Pendlebury and Worsley District Councils, and the Barton Rural District Council, were all ranked in opposition. This is a compact hostile force. But the fight is really on the part of the out-districts; and if it were only "candles" they were contending for, we should say that the expense and trouble to which they have been putting themselves have been ignorantly misapplied. But as a matter of fact, we think Mr. Balfour Browne, K.C., leader for the Salford Corporation, touched the true point of their opposition when he said that the out-districts were, in effect, demanding that they should have a share of the gas profits of the Corporation, or that the profits should be devoted to reducing the price of gas to the consumers, and not be taken in aid of the Salford rates. There is a big controversial point here, and a point that has never reached such importance as it presents to-day. The views of the "JOURNAL" have always been favourable to the profits of municipally owned gas undertakings—after sinking fund and interest have been duly satisfied, and provision made for maintenance and depreciation—being devoted to the general reduction of price. There is greater reason for this now that there is electrical competition, and unequal contribution of gas and electricity profits to the rates. We will let the matter rest there now that, at the end of the week, the battle between the parties is but half way through. Among the witnesses called for the Bill, in the order in which they appeared, were Mr. W. W. Woodford (Gas Engineer to the Salford Corporation), Professor Vivian B. Lewes, Mr. S. Y. Shoubridge, Mr. Charles Carpenter, and Mr. H. E. Jones. Mr. Corbet Woodall, we believe, has also been consulted by the Corporation. Mr. Charles Hunt, Mr. E. H. Stevenson, Mr. Isaac Carr, and Mr. William Cash are looking after the interests of the opponents. With regard to the witnesses for the promoters, it will be seen, from the report of the evidence in our "Parliamentary Intelligence," that the principle of profit appropriation for the rates was not specifically dealt with by those who are concerned in private enterprise.

Yorktown v. Aldershot. The Yorktown and the Aldershot Companies are securing largely extended powers by their appearance in Parliament this year; and they have every reason to rejoice over their good fortune so far. No doubt the Aldershot Company feel a little aggrieved that the Yorktown Company scored a success over them, after the discussion before Mr. Rose's Committee, in regard to the small area respecting the rights to which they were at issue, as explained in the "Notes" last week. It will be remembered that this area contains the War Office Staff College, which was within the limits of the Aldershot Company, but which area they have not supplied. But the Yorktown Company are supplying under contract gas in bulk into the War Office holder at Sandhurst (within the Yorktown area); and the War Office carries the gas to the College for consumption there. The Yorktown Company sought to repeal the Aldershot Company's powers in this small area; and the Aldershot Company quite naturally assumed the defensive. But the Yorktown Company's position was a strong one, in view of the fact that the Aldershot Company have not taken their mains (though their powers have existed for some years) into the area in question. The Yorktown Company have, as we expected would be the case—having in view parliamentary precedents in which the position of the parties had an approximate similarity—succeeded in securing the right to supply in the contested area, and the Aldershot Company's powers cease to apply. But, after all, the Aldershot Company lose nothing but the unexercised powers, excepting, of course, any prospective business that retention of these powers might have brought them. However, this is another instance of Parliament just now being opposed to gas authorities

having dual powers of supply in any district, and of their want of sympathy with undertakings having powers of supply which have for a considerable length of time continued dormant. The decision of the Committee was not given until both Bills had been discussed; and not a small amount of the time on Monday and Tuesday was devoted to the electric lighting powers that both Companies are seeking. Electrical experts gave it as their opinion that it is advantageous for electricity supply to be in the hands of gas companies, from the point of view of the economies to be derived from the two supplies being under one administration. On the other hand, the Easthampstead Rural District Council (opposing the Yorktown scheme) contended that, in the interests of the consumers, it was better the electricity supply should be in different hands, so that all the benefits of competition might accrue. A further ground of disagreement with the proposal was that the admitted loss from the electricity supply during the early stages would fall upon the gas consumers. In this connection, the Committee gave the Companies the powers they sought, save that the supply areas for electricity are to be strictly divided. The Yorktown Company have had a little extension put upon them of the compulsory area within which electricity is to be supplied within the period of five years. With respect to their desired authorization to supply power gas, the Aldershot Company have obtained what they wished for; but the business is to be kept as separate as possible, so that no loss shall fall on the shoulders of the gas and water consumers. The Company are already using power gas for water-pumping purposes; and there are likely customers in mills in the neighbourhood of their pumping-station. Save for the changes that have been made by the Companies in satisfying opponents, and those made under the decision of the Committee, the proposals of the two Bills stand.

Lisburn Purchase. The Lisburn Gas Company and the Lisburn District Council have both had Bills in Parliament this year—the former seeking to be re-incorporated and to be invested with extended powers, the latter to obtain power to buy up the Company's property and business. The Bill of the Council was in a group that was to come before a House of Lords Committee last Tuesday; but prior to this stage being reached, the Company and the Council had arrived at an agreement, which allows the latter's Bill to proceed unopposed, and necessitated the withdrawal of the Company's measure. The experts retained by the parties included Mr. Charles Hunt, Mr. E. H. Stevenson, and Mr. Frank Jones. There may have been others; but anyway a trip taken across to Ireland by Mr. Hunt and Mr. Stevenson appears to have been largely instrumental in expediting a settlement.

Ammanford Gas. Those who went to the Committee-rooms on Tuesday morning, anticipating that there would be something worth hearing as to the exploits of the promoters of the Amman Valley Gas Company were disappointed. Some time since, it was announced in these columns that those holding the reins of the Amman Valley concern—a concern with gas-manufacturing works and no power to distribute the product—at No. 99, Cannon Street, had agreed with their adversaries, finding themselves in a tight corner with the District Council, practically friendless in the locality, and with creditors hotly in pursuit. The adversaries were the promoters of the Ammanford Bill, who were desirous of releasing the Amman Valley shareholders from the domination of the No. 99, Cannon Street promoting coterie, of obtaining from the latter any moneys or shares that they may have received in excess of their deserts, and of placing the undertaking on a better foundation. The agreement with the promoters of the Ammanford Bill meant the withdrawal of the Amman Valley Bill, by which No. 99, Cannon Street had hoped to overcome the disabilities imposed upon them, and legally, by the District Council. The agreement provides for the transfer of the Amman Valley works and such property as may attach to them on terms to be settled by arbitration. The District Council have been satisfied by the adoption of a maximum price for gas of 4s. 3d., instead of a standard of 3s. 9d., with sliding-scale, and a reduction of the dividend from 10 to 8 per cent. Perhaps it is better things should have ended as they have done so far as the people of Ammanford and the deluded shareholders of the Amman Valley Company are concerned; but it would have been an excellent thing to have had the whole story of the promotion of the Amman Valley concern brought out before a Parliamentary Committee. It would have served as a public warning.

A Matter of Practical Politics. Though Bills may be unopposed, or reach that happy state during their progress, it does not follow that there will be no change in the conditions incorporated in the measures during their examination by the authorities of the House. In recent sessions, more than in prior ones, there have been some material changes made in Bills when before the Lord Chairman or the Unopposed Committee of the House of Commons. The Heckmondwike and Liversedge Gas Company's Bill was before Mr. Alfred Emmott and his colleagues on Thursday. The Company were applying for power to supply Mond gas; and the Committee were desirous of learning if there was any evidence as to such gas being in demand. It was pointed out that the Company supply a large manufacturing area, and that there is a field for such gas. This was not enough; and, though authority has been given to other Companies (Aldershot only a day or two before) to supply power gas, the Committee, in this instance, decided that the authorization could very well wait until the matter becomes one of "practical politics." This does not mean a perpetual refusal, or that other cases would not succeed. In connection with the adoption of a standard price and sliding-scale in place of a maximum price, the standard in the Bill stood at 3s. 3d.; but—the Committee seemingly being inclined to think this was a bit too high—Mr. E. H. Stevenson suggested that 3s. would do no injury to anybody. So the proposed standard has receded 3d.

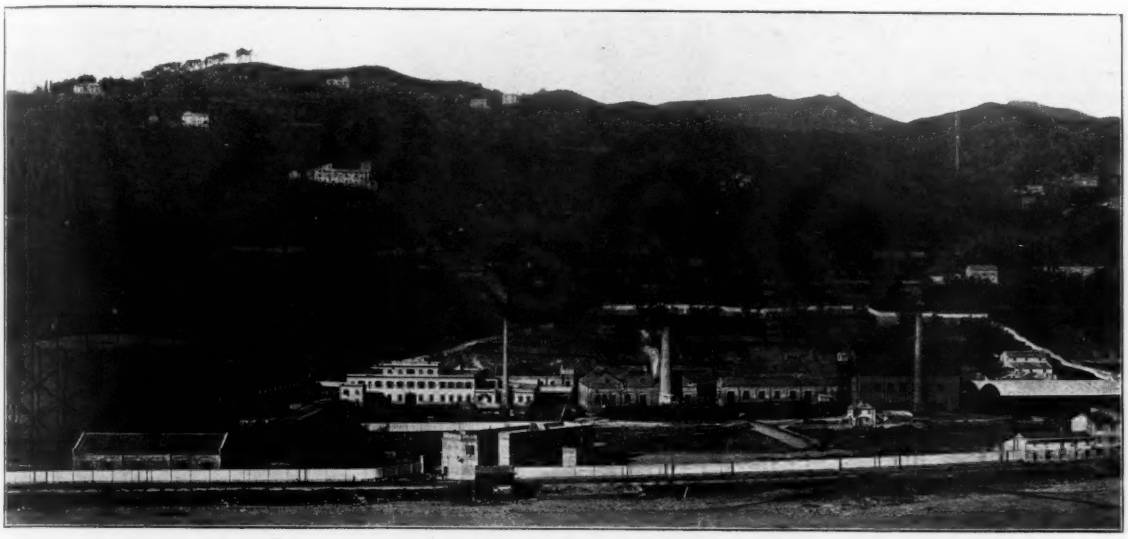
Water Bills. The South Staffordshire Water Company's Bill has aroused a considerable amount of interest before the Committee presided over by Lord Ribblesdale. Three days were devoted to it last week; and a tremendous mass of evidence had been laid before their Lordships. But when the Committee on Friday relinquished their labours for the week-end, the opposition was still proceeding. A further reference will be made to the proceedings when the Committee's decision is known. The Cardiff Corporation Bill is really under the consideration of the Local Legislation Committee; but the water section was specially referred to Sir Luke White's Committee. It occupied two sittings, although once it looked very like monopolizing considerable time. Certain influential landowners, however, had been conciliated; and there only remained the Merthyr Corporation and the Dinas Powis Rural District Council in opposition. The new water scheme that Cardiff has in hand is one that will, when carried out, suffice for some thirty years' needs—so far as can be predicted. The cost will be some £272,000. A central feature of the project concerns the Llwyn-on reservoir—a proposed structure forming part of a previous scheme, but not brought into existence. On its site, it is in contemplation to construct a much larger reservoir, which will be capable of storing 1075 million gallons—nearly 400 millions more than the one formerly designed. This will give the Corporation a reserve for summer use. About six years will be absorbed in the construction of the reservoir; and it will be available for use none too soon, according to the figures presented by Mr. C. H. Priestley, the Corporation Water Engineer. The evidence of Mr. Priestley (which was supported by some of the foremost water experts) put the matter plainly before the Committee. It is unnecessary to notice the opposition of the Dinas Powis Rural District Council or that of the Merthyr Corporation. It was quite clear that they had no ground for complaint; and that they were before the Committee seeking to take an advantage of an opportunity to get for their areas something, if possible, to which they could show no title. The Committee passed the preamble of the Bill. Earl Camperdown is noted in the Committee rooms for the practical view he takes of most measures that come before him. A hint from him last Wednesday made short work for his Committee of the Wakefield Corporation Bill, soon after Mr. Balfour Browne, K.C., had opened for the promoters. The Corporation have not constructed three of the reservoirs authorized in 1889—the Oxgrains, the Booth Dean, and the Linsgreave—but they do not wish to lose the right to them. They therefore asked for an extension of time for ten years. The estimated cost of these works is £149,560. The Rishworth District Council were in opposition, though they had been offered by the Corporation a supply of water at 6d. per 1000 gallons. It was clear to Earl Camperdown that the point at issue was a very small one; and he told the parties so. He adjourned the sitting for the purpose of allowing them to come to a settlement. There was no escape from this; and the parties went out, and settled their differences, whereupon the Bill was allowed to proceed. Fresh portions of the water section of the Oldham Corporation Bill were considered last week—the subjects being the protection of the water supply from pollution, and water charges in the out-districts.

Important Gas Plant Extensions in Contemplation at Leeds.—A deputation of the Gas Committee of the Leeds Corporation have lately been inspecting vertical retorts in operation in Berlin and other places on the Continent; and last Tuesday they presented to the full Committee an unofficial report on the matter. Important extensions of the plant at the Meadow Lane Works will be necessary before long; and it is understood the deputation are perfectly satisfied, after what they have seen, that if the vertical retort system is installed it will entail a great saving in the cost of manufacture, that there will be better results in the way of gas production, and that the residual products will come out much better than under the present system. The further consideration of the subject was adjourned.

Increased Consumption and Reduced Price at Reading.—The Directors of the Reading Gas Company have reduced the price of gas to ordinary consumers to 2s. 6d. per 1000 cubic feet, the reduction to date from the beginning of the current quarter. The Chairman (Mr. J. Okey Taylor, J.P.), who has held this office since the incorporation of the Company in 1862, and was a Director for some years of one of the two old Reading Gas Companies which were then merged into the present Company, has had the pleasure to announce successive reductions in the price of gas from 5s. 6d. to 2s. 6d.—an experience which it is safe to say has fallen to the lot of few, if any, chairmen of gas companies. An interesting fact, too, is that at 5s. 6d. per 1000 cubic feet no dividend was paid; whereas at the present figure the maximum dividends are assured. This is eloquent testimony to the great expansion that has taken place in the sale of gas, and the cheaper methods of gas production which have been evolved during the past half century.

THE NEW GAVETTE GAS-WORKS AT GENOA.

Dessau Vertical Retorts.



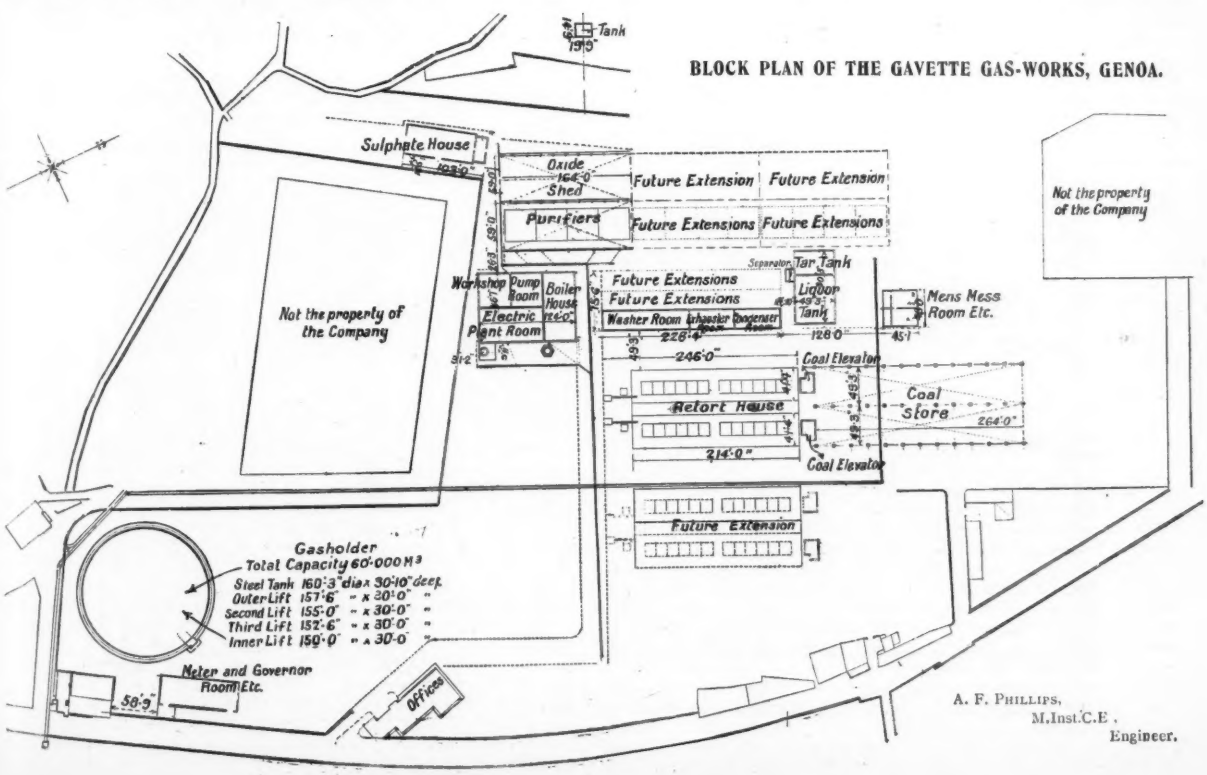
General View of the Works, with the Meter and Governor House in Front of the Gasholder.

THE City of Genoa has developed greatly during the last twenty-five years; and the increase and improvements continue at a surprising rate. Old narrow streets are cleared out; and, in their place, new wide streets are made, on either side of which fine new buildings are erected. The formation of fresh roads on the outskirts of the city is rapidly adding to the area by the latter. With this development, the increase in the consumption of gas continues, notwithstanding the keen competition with the Electric Light Company. The Union des Gaz, who are the proprietors of the concession for the gas lighting, are continually called upon to make additions to the gas-works.

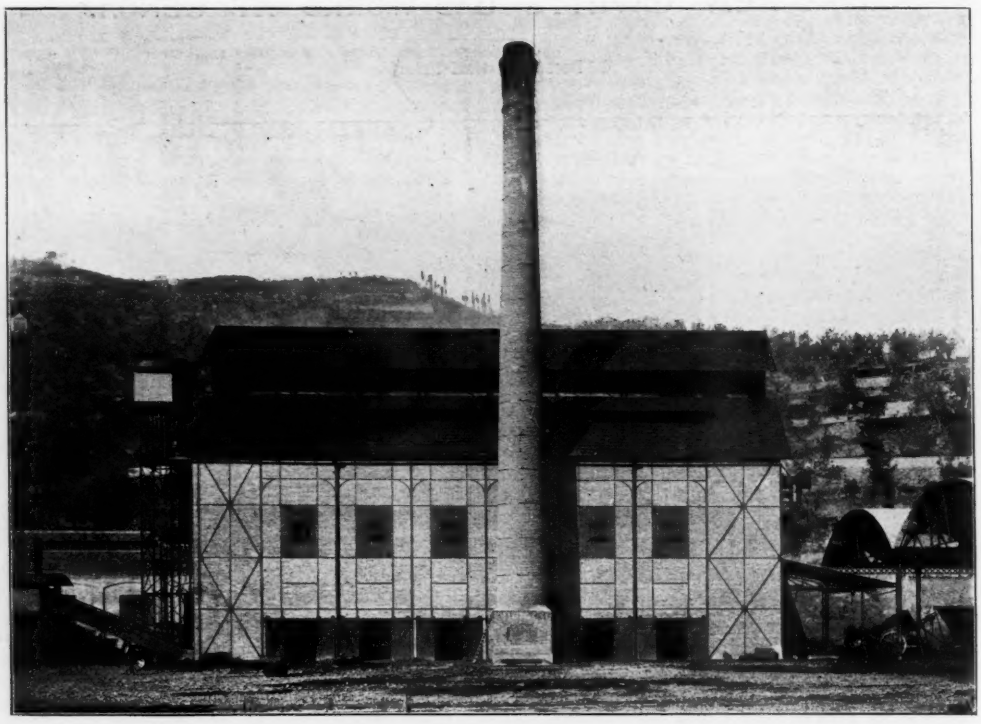
The original gas-works at Bisagno were erected by a French Company in 1847. They were purchased by the Union des Gaz in 1858, when the sale of gas was only about 68 million cubic feet per annum. The works are situated at the foot of a hill; and, the flat surface being soon covered, they had to be extended up the hill, so that there are now practically three levels. As may be supposed, they are exceedingly cramped and inconvenient for the moving of material. They were added to till the annual output of gas amounted to some 220 million cubic feet. About 1851 a gas-works was erected by an Italian Company at Sampierdarena, on the West of Genoa. These, too, were purchased by the Union des Gaz in 1864, who acquired additional land adjoining; and on this site the extensions necessary to meet the additional consumption have been made for some years past, till the output in the year 1907 was 567 million cubic feet from this works alone. The Company's service extends through Genoa and to all the communes, from Sestri on the west to Quarto on the east—a distance of about 8 miles. There are 41,600 private consumers and 5011 public lamps, with an additional 3593 lamps on stairs and in courts.

Such was the flourishing position when it became necessary to make further provision for meeting the growing demands. There was, however, no room for any extension of the Sampierdarena works; and it was impossible to obtain more ground—the sea

BLOCK PLAN OF THE GAVETTE GAS-WORKS, GENOA.

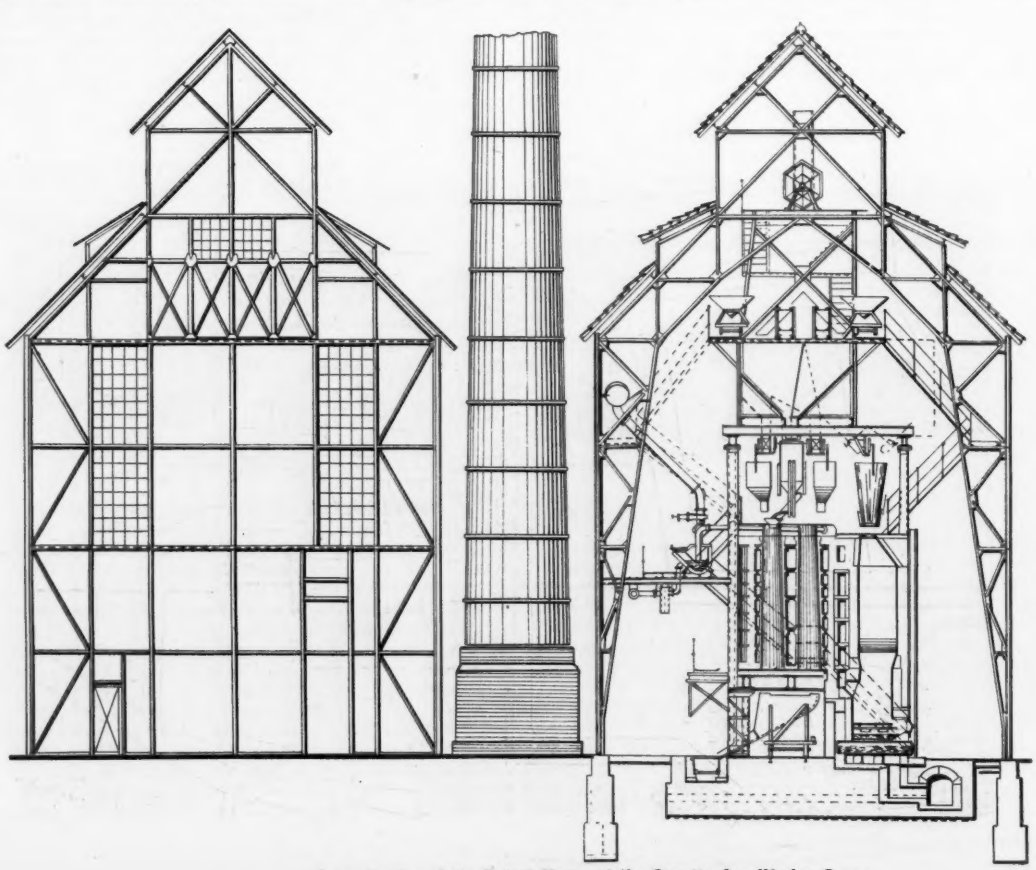


A. F. PHILLIPS,
M.Inst.C.E.,
Engineer.

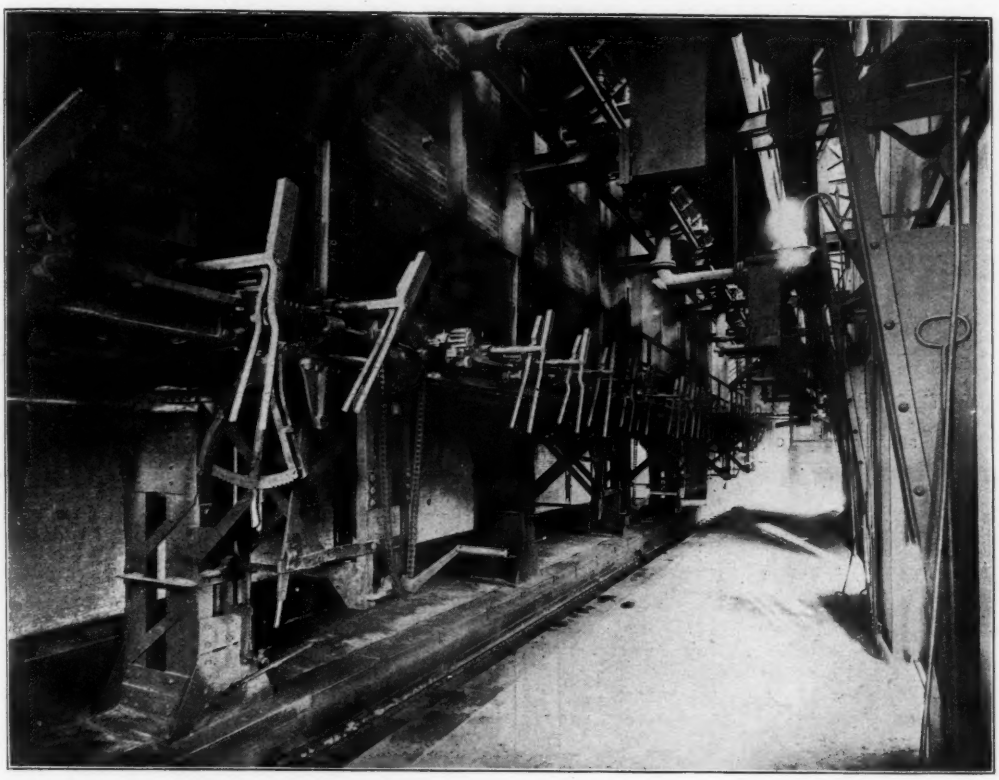


Side View of the Retort-House.

being on one side, the railway on another, and on the other two sides important engineering works. The Company were, therefore, compelled to look out for a site for a third works. But the greatest difficulty was experienced in selecting a position. Genoa is surrounded by hills, the ground below which is all occupied. It was necessary to explore the valleys. In the Sampierdarena valley up which the railway passes to Alessandria, no suitable ground could be found. The Company found themselves eventually obliged to go up the Bisagno valley, about 2¼ miles beyond the present works, where a site was purchased, of which an area of 23 acres is at present taken for the works. Unfortunately, the communication is not good. There is a steam tramway on the road passing the works; but for the present coal is carted from the port. The Government propose making a railway through this valley to relieve the Sampierdarena Railway of some of its traffic. When this is completed, the gas-works will obtain a communication. The River Bisagno runs in front of the site of the works, which site was formerly inundated at flood times. Considerable work was therefore necessary to raise the level of the ground 6 feet clear of the flood-line. The material was provided by excavating into the hill, which work has given an additional area of flat surface.



Cross Section of the Retort-House at the Gavette Gas-Works, Genoa.



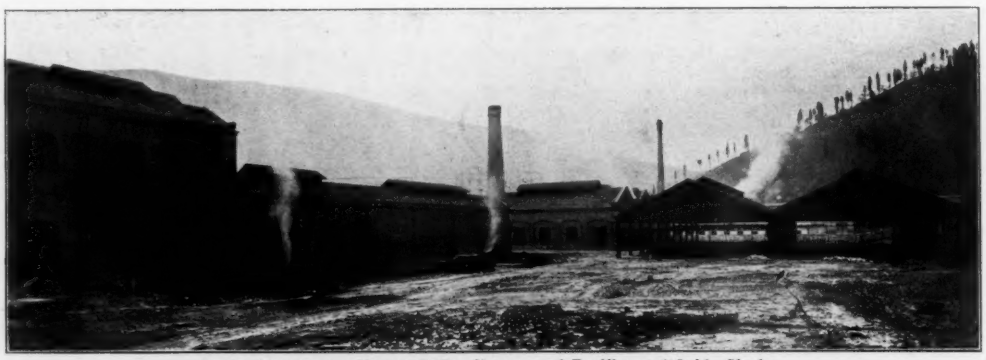
Floor of the Retort-House, Showing the Coke Conveyor and Discharging Apparatus.

The Dessau Vertical Retorts.

The new works are of peculiar interest, inasmuch as in them have been incorporated the first vertical retorts to be set up in the country. Before entering upon the description, it should be mentioned that the whole scheme was designed by Mr. A. F. Phillips, M.Inst.C.E., and the works were carried out in accordance with his plans and specifications. The erection of the works and the execution of all the incidental detail have been superintended, in a most able manner, by Mr. P. S. Morton, the Company's Engineer at Genoa, in whom will be recognized the son of Mr. Robert Morton.

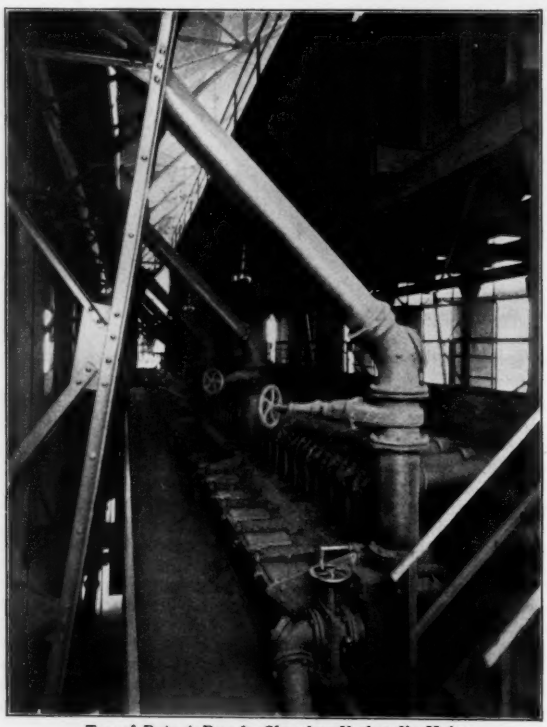
The plan that we publish of the works will show the disposition of the plant; and from it, too, the dimensions of most of the buildings can be obtained, with additional details from the interesting cross section of the retort-house. The works, it will be observed, have been designed for two retort-houses, each capable of carbonizing 240 tons of coal a day, with all the necessary accompanying plant. There is a vacant space at the side of the prospective second house, into which, at some future time, a third house might, if required, possibly be squeezed. Each house will contain four benches of six beds of ten vertical retorts on the Dessau system. Dessau vertical retorts were adopted by the Company, after a most searching investigation by their Engineers, in consequence of the high cost of labour in carbonizing at Genoa. The first bench of sixty retorts was completed, and set to work last January. This brings us to the interesting point of a suitable building for vertical retort-settings in such a hot climate. If the photograph which shows the retort-house on the right hand side is consulted, it will be remarked that the building is an iron-framed one, with brick panelling. But in the photograph only one-half of the house is shown; the other half is to be built on the right-hand side,

Conveyors over the Continuous Coal-Hoppers in the Retort-House.



Back of Apparatus House, Boiler House, and Purifier and Oxide Sheds.

with the chimney shaft between the two sections. The space between the two ranges of vertical retorts will be left completely open straight to the sky for purposes of ventilation. Including



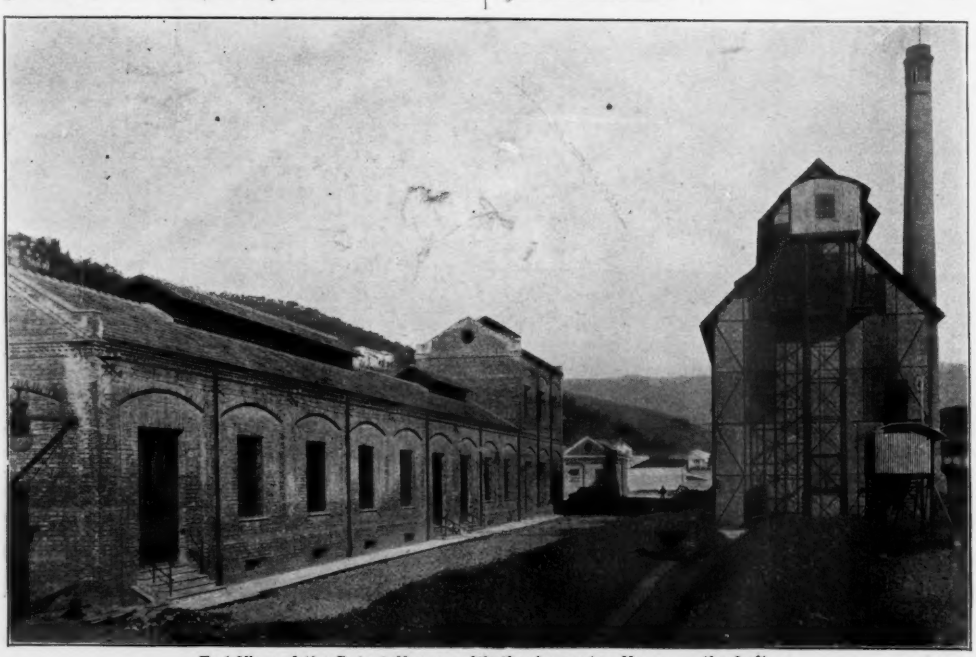
Top of Retort-Bench, Showing Hydraulic Mains.

this open space, the whole area covered by the house to contain the 240 vertical retorts, with a carbonizing capacity of a ton per day per retort, will be 214 feet by 100 feet. It should be explained that the reason the whole of the retort-settings were not erected at once was that the Company naturally desired to make a test of the first sixty retorts before irrevocably committing themselves to their further installation. But practically everything has now been arranged for proceeding with the work.

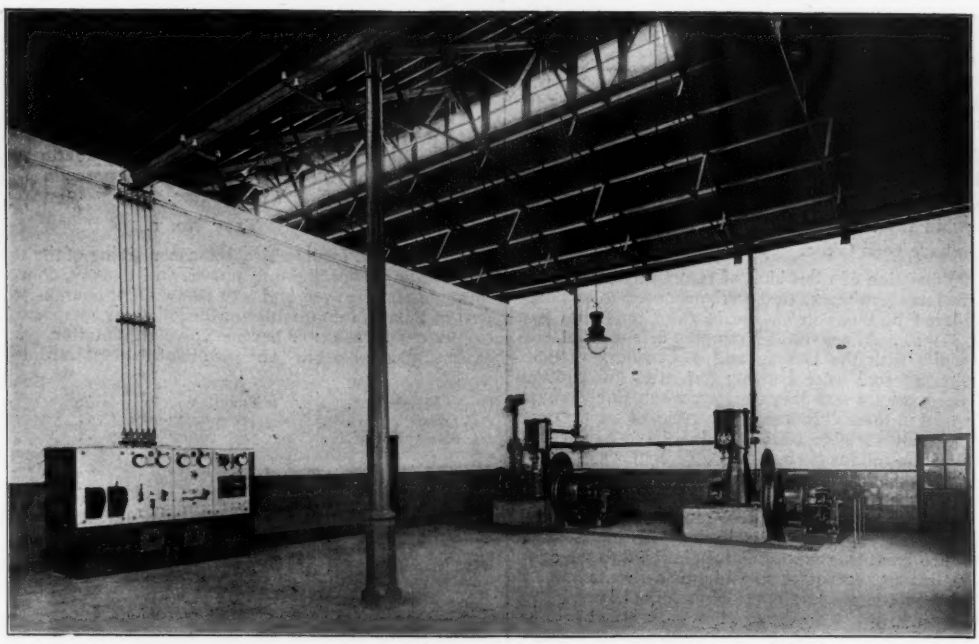
The retorts are 13 ft. 3 in. long, with a section of 22 in. by 10 in. at top, and 27 in. by 14 in. at bottom. The coal is elevated to a breaker on the top of the retort-bench, where it is screened and delivered into a double line of hoppers (with a capacity of 280 tons, or rather more than sufficient for a day's supply) running the whole length of the bench—screened coal being on one side, and fine on the other. The measuring-chambers and travelling charging-shoots (two to each bench) are arranged so that an equal quantity of screened and fine coal is delivered into the retorts; the object being to prevent a lot of dead coal lying at the bottom, and producing undue pressure there. There is also a hopper for storing the breeze placed, to the extent of about 6 inches, in the bottom of the retorts before being charged; and another hopper for the coke for charging the furnaces. The coke and breeze are elevated in trolleys by a lift erected outside the opposite end of the retort-house to the coal-elevator; the trolleys delivering into the breeze and coke hoppers, which are both situated at one end of the continuous line of coal-hoppers. From the coke-hopper, a travelling shoot carries the coke to the producers. The hot coke, on being discharged from the retorts, is removed by a De Brouwer conveyor.

The retorts are charged every twelve hours, each with about ½ ton of coal. At first some difficulty was experienced in adjusting the heating of the retorts to produce gas of the illuminating power required—105 litres to the carcel lamp. Since this has been accomplished, the work has gone on perfectly satisfactorily, both as regards yield and quality of the gas. But in regard to quality, it may be said that no steam has been introduced into the retorts. Everything proceeds with the greatest ease and comfort; and the work is expeditiously performed—thirty retorts being charged by three men with 14 tons of coal in the remarkably short space of 26½ minutes.

The Stettiner Company are under contract to work the whole installation for a time; and they are at present doing the work comfortably with seven men per day, working three shifts. The Directors of the Union des Gaz propose to allow ten Italians for the same work—three for each shift, and an extra one to look after the machines.



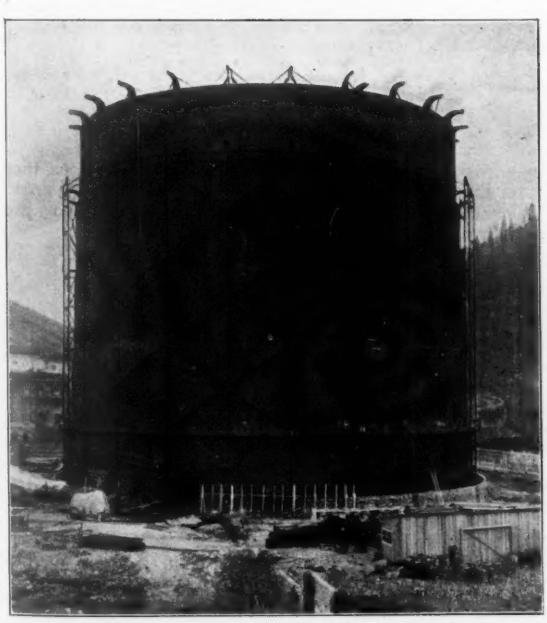
End View of the Retort-House, with the Apparatus House on the Left.



Electrical Plant Room.

Succeeding the Producing Plant.

The rest of the plant has all been erected for the complete house, which it will be recollected will be capable of carbonizing 240 tons per day. The gas first passes a set of atmospheric condensers (contained in a covered house), consisting of four tubes, 39 feet high by 8 ft. 6 in. external diameter. From the condensers, the gas passes to the exhausters—one set being a single exhauster for 120,000 cubic feet per hour, and the other set a pair of 60,000 cubic feet per hour; the object of the arrangement being that one may be run should only half the house be working.



The Gasholder of 60,000 Cubic Metres Capacity.

From the exhausters, the gas travels to the Pelouze tar extractors, the naphthalene washers, the water-condensers, and the "Standard" ammonia washers. This plant is all arranged in one line of buildings, with the connections in a cellar below, so that any part of the plant may be bye-passed, if desired, without difficulty.

The purifiers comprise a set of four, 40 feet square by 5 feet deep, fitted with slide-valves. They are placed under cover, with sheds alongside for the revivification of the oxide of iron.

The gas is registered by a station meter capable of passing 100,000 cubic feet per hour, situated in the same building as the 24-inch and 10-inch governors and the compressing plant for forcing the gas through the 24-inch main to Genoa.

The gasholder is a four-lift one, of 150 feet diameter, and 30 feet deep, and is accommodated in a steel tank. The capacity of the holder is 2,120,000 cubic feet.

The motive power throughout the works, except for driving the exhausters, is electricity. The plant for providing the electric current is in duplicate. There are three boilers of 250-horse power. Two continuous current dynamos, each of 40 kilowatts, driven by two compound vertical engines of 65-horse power. An accumulator is provided sufficient for working the retort-house motors during the night, and so avoiding the necessity of running the electrical plant.

Miscellaneous Features.

Among miscellaneous features, it may be mentioned that there is a large covered space for the coal, with a line of rails and Decauville waggons for taking coal to the hoppers. A separate building has been provided for the workmen. It contains washing rooms, bath, dining-room, and other accommodation. At the entrance to the works is a range of buildings with offices and stores on the ground floor, and residence for the Manager on the first floor. The works are lighted throughout with high-pressure gas on the Selas system.

The Contractors.

The retort-house and the retort-settings were erected by the Stettiner Company, of Stettin. The exhausters were supplied by the Bryan Donkin Company, Limited; the condensers, the tar-extractor, and the washers, by MM. Siry, Chamon, and Co.; and the purifiers and sheds, by Messrs. C. & W. Walker. The station meter and governors were made by Messrs. Parkinson and W. & B. Cowan, Limited; and the gasholder by Messrs. Samuel Cutler and Sons. The boilers were supplied by the Stirling Boiler Company; and the electrical plant by the A.E.G. Thomson-Houston Company. The buildings were erected by Sig. Garbarino and Sig. Musante, of Genoa. The whole of the contractors for the plant did their work in the excellent manner for which they have made their reputations.

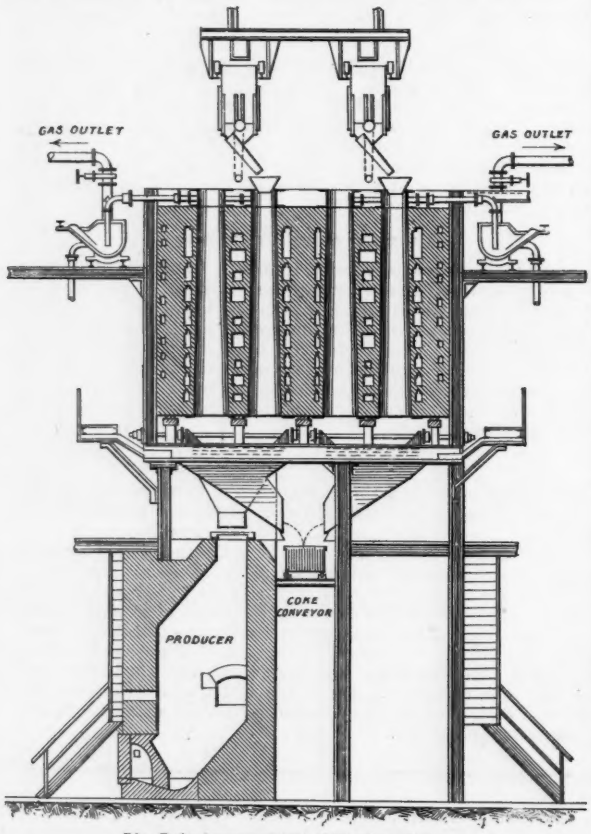
Institution of Civil Engineers.—At the election last Tuesday of President and Council of the Institution of Civil Engineers for the ensuing session, Mr. H. E. Jones was elected a member of the Council. We are pleased to make this announcement, as the representation of the gas industry upon the governing body of the Institution, which ceased on the death of Sir George Livesey, will now be continued.

Southern District Association of Gas Engineers and Managers.—We learn from the Hon. Secretary (Mr. A. F. Browne, of Vauxhall) that the spring meeting of the Association will be held at Redhill on Thursday, the 13th inst. The members will leave Charing Cross Station by the 10.50 a.m. train, and on arriving at Redhill will assemble at the gas-works, where a business meeting will be held for the confirmation of the provisional vote of the members at the annual meeting in March to contribute 40 guineas to the Livesey Memorial Fund. At the close of the business, the works will be inspected under the guidance of the President, Mr. James Paterson, the Engineer and General Manager of the Redhill Gas Company. The members will subsequently partake of luncheon at the Market Hall, on the invitation of the Chairman and Directors of the Company. In the afternoon, there will be a drive to Box Hill, and "high tea" will be served at the Burford Bridge Hotel. The return will be from Box Hill Station.

RESULTS WITH VERTICAL RETORTS AT TRIESTE

In a recent number of our Italian contemporary, "Il Gaz," we see that (under the date of December, 1908) there is an interesting contribution, with tabulated figures and diagrams, from Sig. Ing. E. Sospisio, the Engineer and Manager of the Municipal gas-works at Trieste (Austria). The article records the results of some experiments on a new bench of twenty vertical retorts at the gas-works; and from it the following translated particulars and information have been taken.

Since 1906, the question of what kind of retort-settings should be adopted at the large new works that were proposed to be built, had been considered by those in charge of the Communal gas undertaking at Trieste. When the matter was first studied, the experimental results with the Dessau and Mariendorf vertical retorts using German coal were known; but little information was possessed as to results with these retorts when English coal was exclusively used in them. It was of the greatest importance to know: (1) The way English coal would behave in vertical retorts; and (2) if continuous carbonization of coal was practicable upon a large scale. In order to ascertain the facts on these points, and before launching out on expensive experiments, investigations were begun on one vertical retort only, provided with specially designed charging and discharging machinery. The results obtained from this experimental plant led to the conclusion that "English coal was quite suitable for carbonization in vertical retorts, but in the present state of technical knowledge it was not advisable to put up a large plant of vertical retorts with continuous machinery for charging and discharging."



The Bolz Arrangement of Vertical Retorts.

This much having been ascertained, it was then decided to erect a complete bed of vertical retorts to determine exactly what the results would be with English coal. While the investigations were going on with the Dessau type of vertical retort, Herr Christian Bolz, the Manager of the Buda-Pesth Gas-Works, conceived a new arrangement for such retorts, which offered the following advantages: (1) Double make of gas per bed; (2) possibility of feeding the producer with hot coke; (3) producer independent of the setting; (4) accessibility of regenerators in any part; (5) possibility of having only one conveyor for a double make of gas; (6) saving in first cost of bed and building; and (7) saving in labour.

The advantages promised by the Bolz arrangement led to the construction of one such bed, so as to test it in all its details; and the work was given to the Stettiner Chamotte Fabrik. The design of the bed is shown in the accompanying illustration. The bed was first put into fire on March 30, 1908, but was let out on May 11 following to make a small modification to the producer. It was lighted up again on June 10, 1908, and up to the end of the year—247 days—it had perfectly carbonized 4,693,900 kilos (say, 4694 metric tons) of English gas coal of different qualities, using 852,400 kilos (or 852·4 metric tons) of coke for fuel, which corresponds to 17·95 kilos of coke per 100 kilos of coal carbonized, including scurfing of retorts, closing down, fuel in clinker, &c.

The arrangement of the plant not allowing of the make of gas, yield per ton, calorific and illuminating power of the gas to be taken separately from the other retorts, the following tests were carried out so as to arrive at results approximating to those under normal conditions of working.

Test No. 1.

This test had for its object the ascertaining of the make of gas, its calorific power, lighting power, and density, charging the retorts at the same time, and with twelve-hour charges, with English coal of Pelaw Main quality of the following composition: Water, 0·9 per cent.; ash, 10·8 per cent.; volatile matter, 30·1 per cent.; carbon, 58·2 per cent. The results of the test were as follows:—

		Actual.	Standardized.*
Coal carbonized		10,640 kilos	—
Gas made		3,444 cubic metres	3161 cub. metres
Gas made per ton		323 cubic metres (or 11,590 c. ft.)	297 cub. metres (or 10,657 c. ft.)
Calorific power	max.	5,745 calories	6386 calories
	aver.	5,081 ,,	5308 ,,
	min.	3,549 ,,	3945 ,,
Illuminating power	max.	15·5 Hefner candles	17·2 Hefner candles
	aver.	9·9 ,, ,,	11·3 ,, ,,
Density of the gas made (air=1)	max.	0·426	
	aver.	0·376	
	min.	0·284	

* Reduced to 0°C. and 760 mm.

The temperatures in the different parts of the bed, measured with the Wanner pyrometer, were as follows:—

	Degrees Centigrade.
At the bottom	1298 — 1240
,, ,, middle	1160 — 1141
,, ,, top	915 — 902
In the flue going to chimney	550

Test No. 2.

The object of this test was to find out the make and quality of gas produced from Pelaw Main coal in twelve-hour charges, but in the last hour-and-a-half injecting steam into the lower part of the retort, so as to make water gas.

		Actual.	Standardized.
Coal carbonized		10,560 kilos	—
Gas made		3,821 cubic metres	3524 cubic metres
Gas made per ton		361 c.m. (12,954 c.ft.)	333 c.m. (11,949 c. ft.)
Calorific power	max.	6,026 calories	6752 calories
	aver.	4,673 ,,	5207 ,,
	min.	2,906 ,,	5256 ,,
Illuminating power	max.	19·2 Hefner candles	21·5 Hefner candles
	aver.	9·3 ,, ,,	10·6 ,, ,,
Density	max.	0·466	
	aver.	0·369	
	min.	0·302	

Comparing the second with the first test, it will be seen that the water gas produced per ton of coal carbonized was 333 cubic metres less 297 cubic metres = 36 cubic metres, equal to 10·9 per cent. of the gas made.

Test No. 3.

The third experiment was carried out with the bed in ordinary working with twelve-hour charges made alternately, with Pelaw Main coal, without the introduction of steam. This test and the succeeding ones were made under real normal conditions of working, while the first two had the special object of arriving at the make and the quality of the gas during a period of carbonization. In this third test was also taken, in consecutive hours, the pressure in the retort. This pressure varied from a maximum of 190 millimetres (about 75-10ths) shortly after the charge, to a minimum of 5 millimetres (2-10ths) at the end of the distillation.

The results of the third test were:—

	Actual.	Standardized.
Coal carbonized	21,200 kilos.	—
Gas made	6,877 cubic metres	6385 cubic metres
Gas made per ton	324·4 c. m. (11,640 c. ft.)	301·2 c. m. (10,808 c. ft.)
Calorific power	4,984 calories	5540 calories
Illuminating power	10·1 Hefner candles	11·2 Hefner candles
Density	0·381	
Coke made per ton of coal carbonized—		
Large	693 kilos.	With water.
Medium	43 ,,	
Dust	20 ,,	
	756 kilos	653 kilos (dry 100° C.
Fuel per ton of coal	—	134·0 ,,
Fuel per 100 cubic metres of gas (actual)	—	41·3 ,,

The gas produced was of the following composition:—

	Per Cent.
Carbonic acid (CO_2)	1·0
Heavy hydrocarbons ($C_n H_n$)	2·2
Oxygen (O)	0·5
Carbonic oxide (CO)	5·3
Hydrogen (H)	60·8
Methane (CH_4)	25·5
Nitrogen (N)	4·7
	100·0

The composition of the producer gas included: CO_2, 7·4 per cent.; CO, 23·8 per cent. The analysis of the products of combustion gave: CO_2, 17·7 per cent.; CO, 0·8 per cent. The coke consisted of: Water, 7 per cent.; combustible matter, 77·9 per cent.; ash, 15·1 per cent.

Test No. 4.

This was carried out under the same conditions as No. 3, but in the last hour-and-a-half of carbonization steam was introduced into the bottom of the retort. The results were:

	Actual.		Standardized.
Coal carbonized	21,200 kilos	..	—
Gas made	7,560 cubic metres	..	7047 cubic metres
Gas made per ton	356·5 c. m. (12,792 c. ft.)	..	332·4 c. m. (11,928 c. ft.)
Calorific power	4725 calories	..	5862 calories
Illuminating power	7·1 Hefner candles	..	7·9 Hefner candles
Density	0·401	..	
Coke made per ton of coal carbonized—			
Large	635 kilos	With water.	
Medium	49 ,,		
Dust	52 ,,		
	736 kilos	..	660 kilos (dry 100° C.)
Fuel per ton of coal carbonized	—	..	131 ,,
Fuel per 100 cubic metres of gas (actual)	—	..	36·7 ,,

The gas made was of the following composition:—

	Per Cent.
Carbonic acid (CO_2)	1·8
Heavy hydrocarbons (C_nH_n)	4·6
Oxygen (O)	0·0
Carbonic oxide (CO)	9·2
Hydrogen (H)	58·7
Methane (CH_4)	21·1
Nitrogen (N)	4·6
	100·0

Test No. 5.

Test No. 5 was made with New Pelton Main coal of the following characteristics: Water, 0·8 per cent.; ash, 8·1 per cent.; volatile matter, 34·6 per cent.; carbon, 56·5 per cent. There was no introduction of steam. The results were:—

	Actual.		Standardized.
Coal carbonized	20,400 kilos	..	—
Gas made	6,767 cubic metres	..	6348 cubic metres
Gas made per ton	331·4 c. m. (11,892 c. ft.)	..	311·2 c. m. (11,167 c. ft.)
Calorific power	4,797 calories	..	5278 calories
Illuminating power	8·8 Hefner candles	..	9·7 Hefner candles
Coke made per ton of coal carbonized—			
Large	638 kilos	Dried in air.	
Medium	51 ,,		
Dust	14 ,,		
	703 kilos		

The maximum pressure in the lower part of the retorts directly after the charge was 240 millimetres (95-10ths).

Test No. 6.

This was the same as the preceding one, but in the last hour-and-a-half steam was admitted into the bottom of the retort. The figures were as follows:—

	Actual.		Standardized.
Coal carbonized	20,000 kilos	..	—
Gas made	7,998 cubic metres	..	7453 cubic metres
Gas made per ton	399·9 c. m. (14,353 c. ft.)	..	372·6 c. m. (13,370 c. ft.)
Calorific power	4,529 calories	..	5036 calories
Illuminating power	6·0 Hefner candles	..	6·6 Hefner candles
Coke made per ton of coal carbonized—			
Large	619 kilos	Dried in air.	
Medium	46 ,,		
Dust	28 ,,		
	693 kilos		

The maximum pressure in the lower part of the retort immediately after the charge was 190 millimetres (75-10ths).

Conclusions.

1.—From the working of this bed of vertical retorts, and from the foregoing experiments, it can be said that English coal lends itself very well to carbonization, not alone in these retorts, but also from previous experiments by Dr. Bunte on the same bed with Moravian coal; and the result is that English coal is particularly suitable for carbonization in vertical retorts.

2.—The coke made from English coal is of the best quality, bright, metallic, of large size, and better than that made from Moravian coal, and well adapted to domestic uses.

3.—In the present state of technical information, this type of retort-bed can with every confidence be adopted by gas-works, and will lead to considerable economies in costs of installation and working.

4.—It is to be ascertained from new experiments and further investigations if there really is any advantage in directly producing water gas in vertical retorts at the end of the coal carbonization, because, observing the results of Tests Nos. 4 and 6, and comparing them with Tests Nos. 3 and 5, there is to be noted a reduction in the illuminating power of the gas which is not proportionate to the amount of water gas produced—a reduction the cause of which is not yet known, and which was also noticed in the auto-carburetting of the water gas. It is further to be ascertained if the eventually larger amount of fuel required for the heating of the bed and the greater wear and tear of the retorts are not such as to render it advisable to make the water gas in apparatus specially designed rather than produce it in the retort itself.

5.—Mechanical means for the carrying away of the coke made are indispensable for the working of vertical retorts.

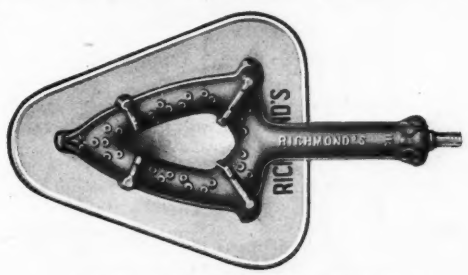
6.—Such conveyors do not break the coke, as it is harder than that made from horizontal or inclined retorts.

7.—With vertical retorts, it is not essential to use perfectly dry coal, and therefore a saving can be made in the roofing to cover the coal-stores.

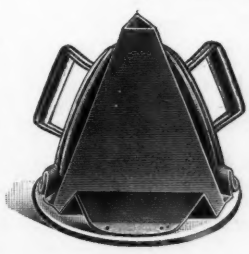
8.—With vertical retorts, a considerable increase in the yield of gas can be counted upon, although it is of lower illuminating power than that obtained from ordinary or inclined retorts.

ACCESSORIES FOR PROMOTING CONSUMPTION.

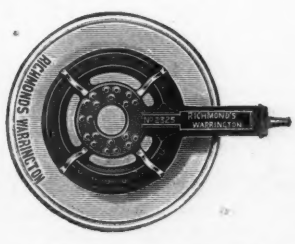
There are no gas-supplying districts, and it may be said there are no households, in which finality has been reached in the possible applications of gas, other than for illumination. We have the gas-cooker and the gas-fire in great variety; and it may be taken that the managements of every gas undertaking, according to the plans that seem to them good, are doing their utmost to expand their uses. But in every household, in connection with the practice of several professions, and in many shops, there are small requirements for heating, to meet which gas (by the design of suitable and simple appliances) can be applied. It is a matter of interest and profit to ferret out these requirements, and for the makers of gas appliances to design the necessary means for satisfying them. Such appliances must be simple, conveniently applied, cheap, and, though cheap, not unattractive. We believe that the more sightly such appliances are made, without being unduly ornate, the more attractive they are, and certainly the greater the inducement to users to keep them clean. It is in cultivating the use of little conveniences in which gas is the fuel that there is a large amount of profitable work to be done. The small consumptions going on here and there throughout the day are not to be despised. The aggregate of small things sometimes makes up something large. The truth of the remark is seen on every side. But it does not appear from general observation that all that could be done is done to propagate such small uses. Consumers have continually brought to notice the gas cooker and the gas-fire. The users of these are in some districts numbered by their thousands; but rare indeed is it that consumers are confronted, with directness necessary to arrest attention, with what may be termed the consumption promoting accessories.



Iron Heater on Enamelled Base Plate.



Pyramid Iron Heater.



Boiling Burner on Enamelled Base Plate.

The point is brought home, and these thoughts cross the mind, on inspecting, in the show-rooms of the Richmond Gas Stove and Meter Company, Limited, certain small, inexpensive, and attractive novelties that have been produced for the purpose of encouraging this small class of business, through which novelties convenience (with a saving of labour) may be given to the consumer, and the gas account be increased. Among them there are new ordinary household flat-iron heating stands, boiling-burners, grillers, and water-heaters, all neat and effective in design, and seductive from the point of view of efficiency. Take first the flat-iron heating stands, they are shaped after the form of a flat-iron, with four raised supports to keep the iron well above the points of combustion all round the tubular body. These stands are fixed to sheet steel metal trays, with slightly raised rims, and enamelled white. There is a clean appearance about them that is suggestive of the cleanliness and of the delicate work that has to be performed on ironing-day in many households, now

that mechanical operation in the laundries, through destruction of linen and other household fabrics, vexes the heart of the careful housewife. The stands fixed to the white tray can be had finished in a variety of tints in porcellanite enamel or in black. The white trays are in themselves a distinctive feature. There are several articles fixed to similar bases. The trays are an extension of the now familiar white enamelled cooker crown-plate, which the Richmond Company claim to have originated some years since. The use of such plates has been carried to the simple, unobtrusive boiling-ring, and the serviceable bob hot-plate; and there is no question they are an aid to cleanliness. The welcome that has been given to the innovation proves its wisdom. A bright, clean exterior, when combined with usefulness, appeals to the consumer; and the slight extra price is not begrudged. There is no doubt, too, that these things will help to brighten the gas showroom window, which is always, owing to the deadly dull black of most gas appliances, improved by introducing colour.

But to return to the articles themselves, the flat-iron heating-stands are, as has been said, cheap; and they look practically everlasting. They can, of course, be used equally well for boiling purposes. Here is another little convenience. It is a pyramid stand arranged for three flat irons; and it is made to simply stand over one of the boiling-rings on the top of the cooker. It is an economical convenience, when more than one iron is required at a time, or irons are rapidly needed in succession, to be able to heat three ordinary irons over one boiling-ring. These, too, are quite inexpensive, and must appeal for their serviceability. Then there are the boiler-rings, fixed to the white enamelled plate as a base. There are also little hot-plates, with boiler burner and griller, all the parts being removable for cleaning, and with white enamelled plate below. These goods are all made in steel, enamelled; one example seen being finished in style giving the appearance of aluminium, and the other in black. The former has a very clean-looking appearance.

Hot-Plate on Enamelled Base Plate.

We cannot describe all that is to be seen in the way of small conveniences for domestic use, but will turn to the water-heaters for various purposes. There is no doubt that the conveniences of water heating by gas offer an excellent field for exploitation. A small heater is the "Avon." Many of the firm's water heaters are appropriately named after rivers. This one, standing on an enamelled shelf, makes a very presentable fitting. The heater is on the principle of metal gills, which conduct the heat of the gas to the water in a copper coil. It is a very compact arrangement, and can be fixed anywhere. It has particular applicability for lavatory basins, for surgeries, dispensing-rooms, chemists, dentists, hairdressers, and so forth. It is, a test shows, a remarkably quick heater; and it gives absolutely no trouble. It is made in two sizes—15 inches and 18 inches wide; and in both cases $7\frac{3}{4}$ inches high by $3\frac{1}{2}$ inches deep. The small size will supply 2 pints of water per minute at 116°; 3 pints at 99°; and 4 pints at 88°. The larger sizes, at the respective temperatures, $3\frac{1}{2}$, 5, and 7 pints.

The "Humber" water-heater is another attractive and well-made article. Being on the convenient hot-water circulating system, it can be readily fixed to either supersede or supplement the coal range boiler, without incurring the cost of new piping, and is also suitable for greenhouses, conservatories, restaurants, and lavatory basins. In one size only, this heater was on the market last season. This year a larger size has been added, fitted with gas and air adjusters. The heater is constructed throughout of heavy gauge tinned copper, and is fitted with flange joints top and bottom. By the simple operation of unscrewing a few nuts, the interior can be taken out, cleaned, and replaced within a few minutes. A perfectly water-tight joint is obtained both top and bottom by screwing up the bolts and nuts again. There are two taps controlling the outer and inner rings of the burner. With the gas full on, a 25-gallon cylinder can be raised to a temperature of 100° Fahr., starting from cold. With only the smaller ring alight, consuming about 10 feet of gas per hour, any quantity of hot water required may be on tap in any part of the house at any time. For greenhouses and conservatories, it will heat from 50 to 80 feet of 3-inch cast-iron pipe, or 80 to 120 feet of 2-inch wrought-iron pipe, according to the size of the heater.

Another water-heater differing in duty is the "Economic." It is particularly for the wash-house, and takes the place of the ordinary coal copper. Being on legs, it is a convenient height for easy lighting and general use; and another advantage is that it takes up half the room of the old-fashioned copper. It has a galvanized body and lid, tinned copper pan, and flue-outlets for steam and waste gases. It can also be had in a somewhat cheaper form, with a rustless cast-iron pan. The capacity is 10 gallons. For new property, a copper like this saves money for the builders; and the gas suppliers are benefited. The distribution department officials of gas-works should look out for new property, and try to secure the introduction of such conveniences. By them, saving of time and labour is secured; and they are popular where there has been experience. The "Economic" is simple in construction, and repair is quite an easy matter.

"Avon" Water-Heater.

"Economic" Wash-House Boiler.

"Humber" Water-Heater.

This article is not intended to deal with the larger productions of the firm in the way of cookers—ordinary and slot. But it may just be mentioned that the samples on view in the show-rooms exhibit the firm's usual care in the matter of detail; and it is noticed that minor improvements—minor yet of importance in themselves—have been introduced. Besides efficiency in relation to gas consumption, other advantages in the cookers are the interchangeable and removable (without screws) hot-plate burners and oven burners, and the burner carrier and gas bar. The linings are enamelled by Richmond's patent process; and this ensures an enamel absolutely non-porous, smooth as glass, easily cleaned, and of a permanent character.

"Transactions" of the American Gas Institute.—We have received the "Transactions" of the American Gas Institute for last year. It contains the report of the proceedings at the third annual meeting, held in New York from the 21st to the 23rd of October, under the presidency of Dr. A. C. Humphreys, Principal of the Stevens Institute of Technology. In addition to the President's Address and the papers, some of which have been given in the "JOURNAL," there are a number of reports by Special Committees; among the subjects dealt with being screw-threads and pipe standards, calorimetry, a unit of light, and the definition of heating value. An appendix to the report of the Trustees of the Gas Educational Fund contains the answers to several series of questions in the practical class, occupying 190 out of the 1056 pages in the book. Other features are the "Wrinkles" and the "Question-Box." Reference to the subjects dealt with in these three sections is facilitated by an index in each case. The rest of the matter consists of the accounts, &c. A portrait of Dr. Humphreys forms a frontispiece to the volume, which contains numerous illustrations and several plates. The book is published by the Institute, under editorship by the Publication Committee.

CLEANING GAS-COOKERS, SERVICE-PIPES, GAS-FITTINGS, &c., BY SAND BLAST.

A Novel Introduction.

Gas engineers are ever alive to new ideas that promise to promote economy and efficiency in the divers operations appertaining to the production and utilization of coal gas. A new idea is before us to-day; and, what is more, its practicability has been successfully demonstrated in the shops of the distribution department of the Tottenham and Edmonton Gas Company, through the enterprise of the Engineer and General Manager (Mr. A. E. Broadberry, Assoc.M.Inst.C.E.). Those who know the condition in which gas cookers, grillers, rings, &c., are frequently returned from hire, and the dirty work involved in overhauling and cleaning, must welcome anything that aspires to minimize both cost and labour in carrying out the renovating operations. In the old processes of baking the stoves, for which special ovens have to be erected, or of pickling, the subsequent scraping and wire-brush cleaning to remove the coating of oxide formed ready for re-coating before being re-fitted, is a most tedious operation, and cannot be by any means claimed to be healthy work. To accomplish this by a cheaper and healthier method are the objects Mr. Broadberry has had in installing a sand-blast plant, consisting of an air-compressor, an air-receiver, sand-blast apparatus, turntable, and an exhauster—the whole of the machinery being driven by a 9-H.P. gas-engine. We are pleased to learn that it is giving good results.

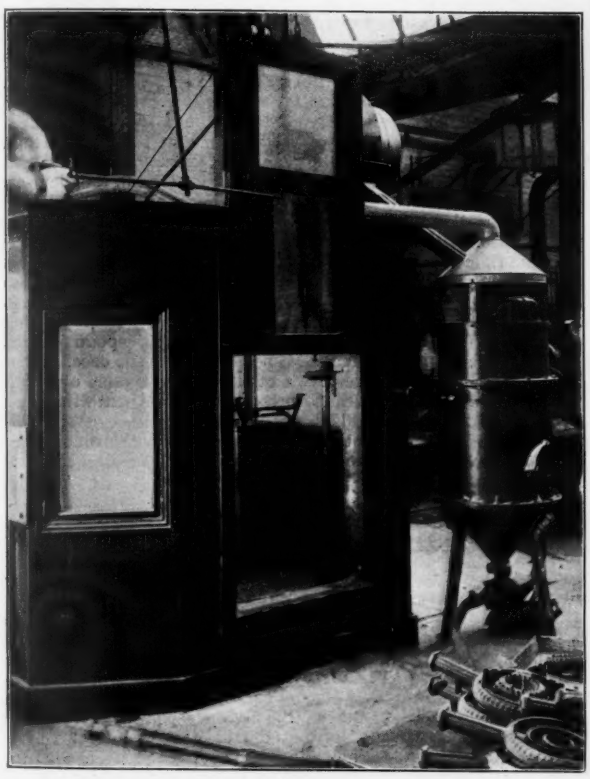


Fig. 1.—The Cleansing Chamber, with its Sliding Door Raised.

The operations are briefly described as follows: Air is compressed to 1 atmosphere (15 lbs.) into a receiver, and is then conveyed into the two-pressure apparatus, which produces the sand-blast by the intimate mixing of quartz sand and compressed air. To the bottom of this apparatus is fitted a length of special india-rubber hose, at the other end of which is fastened a nozzle, which the operator directs on to the part to be cleaned —regulating the blast as necessary. A small chamber made of matchboard and zinc, or tin-lined, encloses a turntable, whereon the cooker is placed; and, when sufficiently cleaned on one side, the operator, by the aid of a winch, turns another side to view, and continues the blast until the cleansing is perfect, and the cooker is then quite ready for varnishing. The cleaning sand or other material used, drops through the grids of the turntable into a trough below; and by a spiral conveyor is passed along, and returned by a bucket elevator for use again into the two-pressure apparatus. Any dust created which does not gravitate into a sand-settling box fitted with baffles, is either exhausted into the atmosphere outside the workshop, or into any convenient shaft. Should it be absolutely necessary to abolish the dust entirely, the air and dust can be filtered. With reference to this latter process, we must compliment the Engineer upon his innovation in dealing with the dust question by means of a "Cyclone" separator, fitted

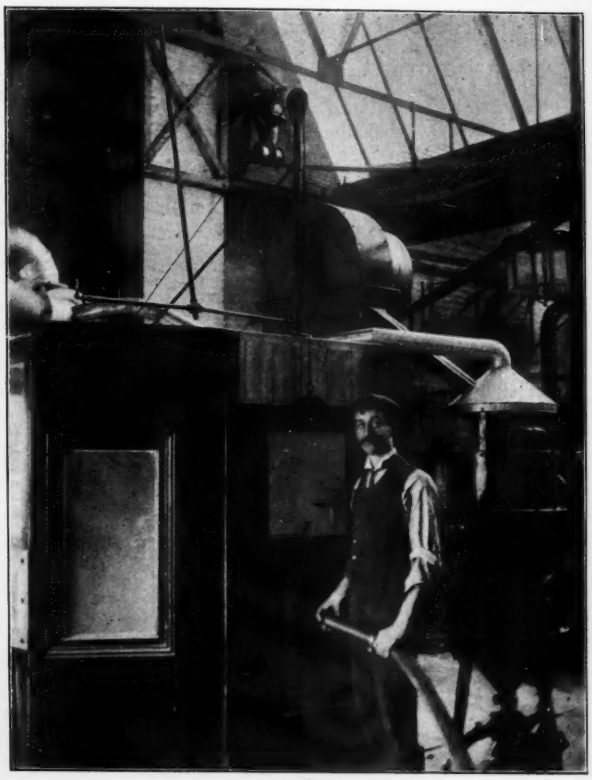


Fig. 2.—The Sliding Door Lowered.

with a water-spray, which reduces the dust to mud, and deposits it in a tank underneath.

The illustrations reproduced here are reproductions of photographs of the plant at Tottenham. Fig. 1 shows the sliding-door of the cleaning chamber raised; and a cooker on the turntable in position for cleaning. In fig. 2, the sliding-door is lowered; and the workman is ready to start cleaning. Readers will observe that the nozzle is passed through a slit in a rubber curtain; and the man can see his work through a window in front of him. Fig. 3 is a back view of the plant, showing the two-pressure apparatus, the elevator casing, with sandslide, the "Cyclone" separator on the right, and the exhauster in the background.

It is worthy of note that it is possible to utilize the sand-blast

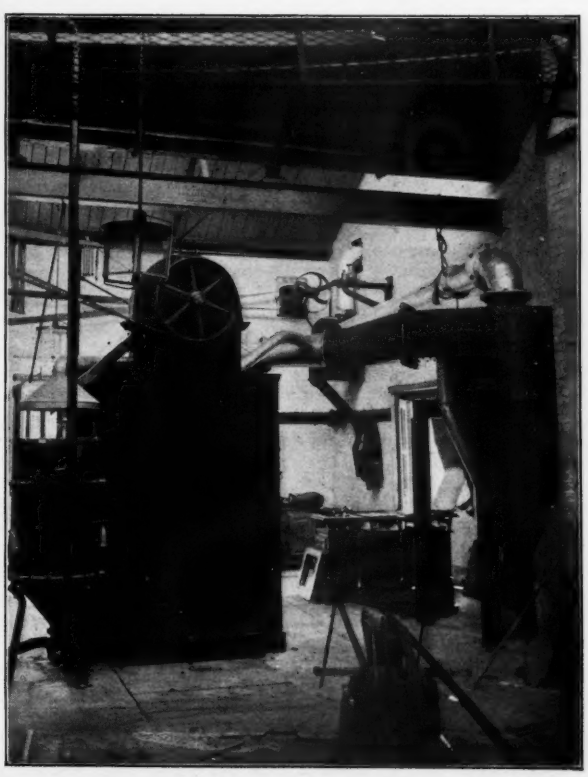


Fig. 3.—Back View of the Plant.

plant for a variety of purposes in a gas-works. For instance, by subjecting lengths of excavated service-pipe to the blast, any fault is readily exposed. Brass fittings, nuts, bolts, flanges, &c., which were formerly scrapped, can be cleaned with rapidity, without damaging the threads, and be put into use again.

The work of cleaning and renovating cookers is growing considerably; and reduction of labour involved for any given number of cookers is a matter of importance. The output of the machine, after the one man had only had a fortnight's training, was twelve complete cookers a day. Formerly the work was carried out by two men and four boys, who never reached this total; and most probably only did ten cookers. The action of the sand-blast is remarkable, as every crevice is reached; and the inner parts of the rings, which were so difficult to clean by the old method, are thoroughly treated. In fact, the stoves in many instances seem almost fit after the sand-blast treatment to be sent out without further varnishing.

The London Emery Works Company, of Park, Tottenham, who manufacture and erect these plants, have other installations, capable of dealing with six or twelve cooker bodies per hour, worked by two or four men simultaneously. The success at Tottenham has induced them to pay special attention to this new branch of their business; and there is no doubt much more will be heard of the use of the process in gas-works in future.

WATER-HEATING BY GAS AND ELECTRICITY.

A Comparison of Cost.

In the "Correspondence" columns of the "Journal" for the 20th ult. (p. 166), we published some interesting comparisons supplied by Mr. Cyril Davis, Managing-Director of the Davis Gas-Stove Company, Limited, regarding the comparative heating values of gas and electricity for cooking purposes. At the end of the letter, Mr. Davis remarked that investigations had been carried on with regard to the use of the two agents for water-heating purposes; but as his letter had already extended to some length, he refrained from including them in his communication. The subject, however, is one of such general interest, that we asked the Company to furnish the data derived from their further investigation; and they have complied with the request. The following is their communication.

As stated in our letter, we can get 23,162 B.Th.U. from one pennyworth of London gas at 2s. 3d. per 1000 cubic feet; whereas with electric current at 1d. per unit we only get 3437 B.Th.U. available. In the test given below, the relative prices of the gas used and assumed for electricity are 2s. 1d. and 1d. respectively —*i.e.*, the local rates at Luton.

First Test.—High-Grade Geyser.

Heat absorbed per hour . . . . . 34,440 B.Th.U.
" " per cubic foot of gas used . . . 546 "
Cost per 10,000 B.Th.U. absorbed, 0·458d.

Second Test.—Gas-Heated "New Davis" Circulator.

Heat absorbed per hour . . . . . 17,000 B.Th.U.
" " per cubic foot of gas used . . . 500 "
Cost per 10,000 B.Th.U. absorbed, 0·5d.

Third Test.—Ordinary Boiling-Ring.

Heat absorbed per hour . . . . . 2623 B.Th.U.
" " per cubic foot of gas used . . . 305 "
Cost per 10,000 B.Th.U. absorbed, 0·82d.

To avoid any possibility of being criticized as to the method employed in converting the electric current into heat, we compare the above practical test with electricity at an efficiency of 100 per cent., at which figure we get the cost of 10,000 B.Th.U. as being 2·9d., and thus get the following comparisons:—

10,000 B.Th.U. absorbed by	electric-stove	costs	2·9d.	= 633
" " "	gas-geyser	"	0·458d.	= 100
" " "	gas-circulator	"	0·5d.	= 109
" " "	gas-ring	"	0·82d.	= 179

These figures are obtained with electricity giving 100 per cent. efficiency and at the unusual price of 1d. per unit and 2s. 1d. per 1000 cubic feet for gas. These should be more like an average of 2½d. and 3s., when we get:—

10,000 B.Th.U. absorbed by	electric-stove	costs	7·25d.	= 1320
" " "	gas-geyser	"	0·549d.	= 100
" " "	gas-circulator	"	0·6d.	= 109
" " "	gas-ring	"	0·984d.	= 179

From these figures it will be seen that, with current at 2½d. per unit and 100 per cent. efficiency, against the results of an actual test with gas at 3s. per 1000 cubic feet in an ordinary geyser, the relative costs are:—

Gas . . . 1d. .. Electricity . . 1s. 1·2d.

Readers of the "Journal" may remember that Mr. Sydney March, of Chelsea, has produced a bust of the late Sir George Livesey. We are pleased to learn that it is now being exhibited at the Royal Academy.

THE ADVANTAGES OF STEAMING IN VERTICAL RETORTS.

Dr. R. Geipert, one of the Assistant Engineers at the Mariendorf (Berlin) works of the Imperial Continental Gas Association, has contributed to the "Journal für Gasbeleuchtung" of April 24 an article on the advantages of admitting steam into vertical retorts. It will be remembered that Dr. Geipert was, jointly with his Chief, Mr. E. Körting, responsible for a paper on the same subject which was published in the "Journal" for Nov. 10, 1908 (p. 404). In the same number of the "Journal" (p. 400) some criticisms were offered on the arguments advanced by Mr. Körting and Dr. Geipert in favour of the addition of steam; and somewhat similar criticisms have since been made by Herr Terhaerst and Dr. Trautwein, of the Nuremberg Gas-Works (see "Journal" for March 30, p. 903). The latter criticisms are now referred to by Dr. Geipert. From the theoretical standpoint, the question of the economy of the admission of steam into vertical retorts has also been discussed by Dr. Strache, of Vienna, with reference to results reported by Mr. Körting and Dr. Geipert (see "Journal" for Jan. 12, p. 95). The following is a summary of Dr. Geipert's article.

The crucial point on which a decision must be arrived at as to the economy of admitting steam into vertical retorts is the amount of fuel consumed in the retort-furnaces. It is useful to consider also *a priori* from the theoretical standpoint the conditions in which water-gas manufacture must be conducted in retorts if it is to prove economical. It may be advantageous or not, according to the conditions of working. The aim must be to economize furnace fuel as far as possible. In the following discussion of the question, it will be assumed in the first place that the heat imparted to the setting in unit time is constant. This condition can practically readily be fulfilled, as the draught of the setting always remains the same while the secondary-air damper is not moved, and the proper proportion of producer gas to secondary air is obtained solely by regulation of the primary-air damper. If in these conditions it is desired to make water gas, the time during which the charge remains in the retort must be prolonged and steam introduced for the extra time. The greatest duty is secured when a large quantity of water gas is made in a short time. It may, however, be questionable whether sufficient extraneous heat enters the retort to correspond with the quantity of steam introduced. When this is not the case, the hot coke presents a useful reservoir of heat, to the value of which attention was directed in the former article. The heat withdrawn and supplied may be checked by calculation.

The following statement shows the heat the hot furnace gases supply for water-gas production. The equations concerned are:

(1) $C + H_2O = CO + H_2$
(2) $C + 2H_2O = CO_2 + 2H_2$

According to equation (1) the heat expended on the production of 1000 cubic feet of water gas is 101,124 B.Th.U., and according to equation (2), 73,483 B.Th.U. Consequently, water gas containing 6 per cent. of carbonic acid requires for its production 96,180 B.Th.U. per 1000 cubic feet. In the former article it was calculated that at least 42·4 per cent. of the heat introduced into the setting goes towards the carbonization of the coal. This proportion, when the consumption of fuel in the furnaces amounts to 14 per cent. of the weight of coal carbonized and the fuel (coke) has a calorific value of 12,600 B.Th.U. per pound, corresponds to 1,675,377 B.Th.U. per ton of coal carbonized. The time of carbonization is ten hours; so that the heat taken for carbonization is at the rate of 167,537 B.Th.U. per hour, which should suffice to produce 1700 cubic feet of water gas per hour. Taking the heat utilized for carbonization at 42·4 per cent. and the calorific value of the coke as stated, it follows that 18 lbs. of coke consumed in the retort-furnaces corresponds to the production of 1000 cubic feet of water gas. The heat withdrawn from the hot coke resulting from a ton of coal, if the coke is cooled to (say) 200° C, amounts to 252,887 B.Th.U., assuming that the mean specific heat of carbon is 0·448 (Kunz). This amount of heat will afford 2630 cubic feet of water gas without any further expenditure on furnace fuel.

It is assumed in this argument that the 167.537 B.Th.U., which represents the average consumption of heat per hour of the retorts during the carbonization, without the admission of steam, of one ton of coal, will also reach the retorts during the extended period in which steam is admitted. This, however cannot be forthwith assumed, as every transference of heat depends on a fall of temperature; and this is not uniform from time to time in the gasification of coal. At the beginning of carbonization, the cold coal cools the inner walls of the retorts, and so brings about a great fall of temperature; whereas towards the end of the carbonization the incandescent block of coke has a temperature not far below that of the furnace gases. When steam is admitted, the block of coke is again cooled, and, consequently, there is again a fall of temperature. Thus the primary effect of the admission of steam is a cooling of the coke, and a secondary consequence is the taking up of extraneous heat. Thus, in fact, the production of water gas

will be distributed between the two sources of heat. For instance, in the conditions of heating assumed, there should be a make of water gas of 4342 cubic feet per hour per ton of coal carbonized, or about 40 per cent. of the make of coal gas.

If, however, the quantity of heat transmitted to the retort in the extra time during which steam is admitted does not correspond with the average transmitted before steam is admitted, it can obviously only be less than the latter, because the average fall of temperature from the furnace gases to the block of coke must be as high (if not higher) when steam is not admitted as when it is admitted. It is thus possible that less heat is taken up by the retorts while steam is admitted than when it is not. In that case, less heat needs to be imparted to the setting, and, taking the extreme case, no heat would have to be taken up by the retorts except that necessary to cover losses by radiation from the setting. These losses are constant per unit of time, provided the temperature of the setting remains the same. They may therefore be given an absolute value which, for the conditions of the normal ten-hour period of carbonization, can be taken at a maximum of 35·8 per cent. of the fuel consumed in the furnace. As this fuel consumption amounts to 14 per cent. of the weight of coal carbonized, and 5·13 tons of coal were carbonized (at the Schlieren works, at Zurich) in ten hours, the loss by radiation per hour is equivalent to the calorific value of 55·8 lbs. of coal. If the quantity of heat corresponding to this effect is introduced to the retort-setting, a loss through the sensible heat of the flue gases has to be taken into account, amounting to 21·8 per cent. of the heat applied. Thus, to make good the losses by radiation from the setting, 71·4 lbs. of coke are required as furnace fuel. In the hour there is produced by means of the sensible heat of the coke in the retort 13,032 cubic feet of water gas per setting. This sensible heat does not cost anything. So that only the loss by radiation has to be reckoned against the water gas; and therefore per 1000 cubic feet of water gas only 5·5 lbs. of coke are required. These considerations only admit of limiting values being deduced for the furnace fuel consumed during the extra time in which steam is admitted, which values are as follows per 1000 cubic feet of water gas made :—

18 lbs. of coke if the water gas is made exclusively by the expenditure of external heat.

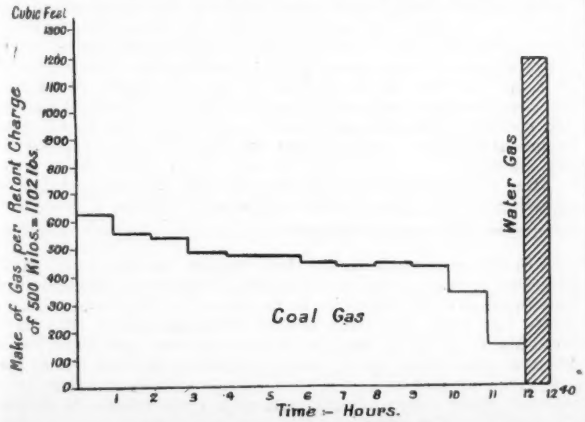
5½ lbs. of coke if the sensible heat of the hot coke in the retort suffices by itself for all the heat required.

In the conditions assumed, the figures obtainable in practice must lie between these limits, and will amount, if (for example) the above 40 per cent. of water gas is made in an hour, to 7 lbs. of coke per 1000 cubic feet of water gas. It may be remarked that the loss by radiation from the setting of 35·8 per cent. is a particularly high and therefore unfavourable figure.

So far therefore as the heat available for water-gas production is concerned, a very large make of water gas in a very short time and with small consumption of furnace fuel may be reckoned on. In water-gas production, however, it has generally to be taken into account that the conversion of the steam by incandescent carbon depends not only on the heat, but also on the rate of flow of the steam. So that a point will be reached at which the extent of decomposition of the steam by the carbon will be too small, or the quantity of steam remaining undecomposed will increase to such an extent that the excessively forced make of water gas will in consequence be carried out at a loss. One point of advantage is that the production of water gas can be started before the coal is completely carbonized; so that, without extending the time during which the charge remains in the retort, it is possible to produce water gas at a low cost. But in this case the make of water gas is naturally restricted to a comparatively small limit.

The course of gasification after the admission of steam is portrayed in the annexed figure. The curve for carbonization without the admission of steam is taken from the results obtained by Dr. Bueb at Dessau in 1906 (see "JOURNAL," Vol. XCV., p. 23), and the extension for the admission of steam is based on the make of water gas obtained at Zurich last year (see "JOURNAL" Oct. 27, 1908, p. 256). This combination is admissible because great precision is not aimed at, but rather a portrayal of the conditions which have been described as favourable for water-gas production in the retorts, and the water gas is reckoned on the difference of 40 minutes between the times during which the charge remains in the retort. It will be seen that the make of coal gas falls off steadily, and by the twelfth hour has reached a minimum. Steam is then admitted, and the make of gas is increased so that it is greater than that of coal gas at any time. The coal gas made per hour amounts per ton of coal carbonized to, at a maximum, 1328 cubic feet; at a minimum, 323 cubic feet; and on the average, 962 cubic feet; while the water gas made in 40 minutes corresponds to a make of 2476 cubic feet per hour.

Course of Carbonization, without and with Steaming, in Vertical Retorts.



Make of Gas Per Hour, in Cubic Feet.

These figures indicate that water-gas production in vertical retorts is economical, as was shown by the practical trials at Mariendorf and Zurich. Taking the results of the Zurich trials, it was found that, when steam was admitted to the retorts, there was a consumption of coke in the furnaces equivalent to 15 per cent. of the weight of coal carbonized; while when steam was not admitted, the consumption was only 13·9 per cent. There was thus a difference of 1·1 per cent., to which 1579 cubic feet of water gas per ton of coal carbonized are to be ascribed. Hence the coke consumed in the retort-furnaces per 1000 cubic feet of water gas made amounts to 15·6 lbs. With this figure as a basis, the following comparison between working without and with the admission of steam is obtained, taking as the scale of working a make of 141 million cubic feet (4 million cubic metres) of water gas per year of 300 working days.

One setting produces per diem 144,020 cubic feet of mixed gas, of which 17,658 cubic feet will be water gas. Thus, in 300 working days, 5,300,000 cubic feet of water gas will be obtained per setting. In order, therefore, to produce a mixed gas containing 141 million cubic feet of water gas, 26·7 settings of vertical retorts will be required. When steam is admitted to the retorts and the charge remains in them for 12 hours 40 minutes, the quantity of mixed gas made per diem will amount to 3,845,206 cubic feet, of which 3,374,091 cubic feet will be coal gas. To produce the same quantity of coal gas in retorts when working without the admission of steam, 25 settings would be in use daily and a charge would remain in the retorts for twelve hours. To bring the quantity of gas up to 3,845,206 cubic feet, it would be necessary to add 14 per cent., or 471,115 cubic feet of water gas. Thus 1·7 settings were required for the production of water gas. If this water gas were made in an independent plant and the vertical retorts were worked without the admission of steam, the following would be the cost of production of 141 million cubic feet of water gas:

6 per cent. interest and depreciation charges on a capital outlay on plant of £4250	=	£255
Cost of repairs	=	350
Wages at about 1¼d. per 1000 cubic feet	=	400
Coke 40·7 lbs. per 1000 cubic feet at £1 0s. 4d. per ton	=	2608
Total		£3613

If the same amount of water gas were made by admitting steam into vertical retorts, the cost would be as follows:—

6 per cent. interest and depreciation charges on a capital outlay on plant of 1·7 settings at £2000 per setting	=	£200
Cost of repairs at £150 per setting	=	255
Wages for 1·7 settings	=	85
Coke consumed as retort-furnace fuel per 1000 cubic feet	= 15·6 lbs.	
Coke combined as carbonic oxide in the water gas	= 14·7 ,,	
	30·3 lbs.	
= a total of about 1907 tons at £1 0s. 4d. per ton		= 1940
Total		£2480

Consequently, there is an annual saving by the admission of steam to vertical retorts of £1133, or, per 1000 cubic feet of water gas, 1·9d.

In regard to the calculation and comments of Herr Terhaerst and Dr. Trautwein, it may be pointed out that the foregoing figures are based on practical working results. The figures for the water-gas plant correspond with the average realized on several years' working. No value is attached to the recovery of retort scurf, because it would be attended with expenditure on wages, and would carry with it the risk of injury to the walls of the retorts, whatever method of removal was adopted. In cases where the working figures differ from the above, the calculation must naturally be altered. In any case, however, it may be remarked that the practical results support the theory that there is a special advantage in making water gas in vertical retorts, because the sensible heat of the coke can thus be utilized. Also, it is possible to make water gas before carbonization is complete. The objection that water-gas production in the retorts has an unfavourable effect on the durability of the material of the retort and on the hardness of the coke and its calorific value, is rendered of little force by the fact that the absorptive capacity of the steam for heat is so small that, relatively to the heat withdrawn from the retort by the charge of damp and cold coal, it becomes negligible—being only a few parts per cent. of the latter; also it is as nothing compared with the quantity of heat which the hot coke suddenly loses on quenching. The change of calorific value of the coke depends on the proportion of ash it contains,

and is likewise not worth mentioning. The difference in the amount of coke made when steam is not admitted and when it is admitted is only about 1·45 per cent. of the weight of the coal; so that if the coke in the one case contained 12 per cent. of ash, it would in the other case contain 12¼ per cent. of ash. The difference of ¼ per cent. in the amount of ash would cause no appreciable diminution in the calorific value of the coke.

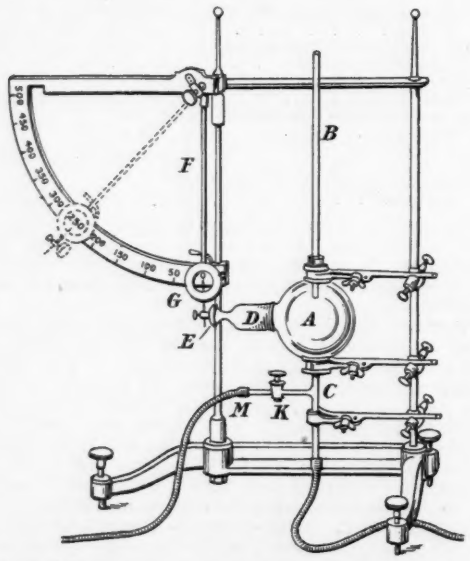
GAS-FIRED POTTERY KILNS.

At the Municipal Secondary School, Hanley, on the 24th ult., Mr. H. Ansell, of Barrhead, Glasgow, gave a lecture on "Coal and Gas Fired Continuous Kilns for Pottery." After describing various kilns, and stating that the muffle kilns use far more fuel comparatively, weight for weight, than any other kind, the lecturer showed a drawing of an ordinary type of coal-fired muffle kiln as employed in the manufacture of fire-clay, and said these kilns turned out some good work, but had their faults and were heavy with fuel. Passing on to gas-fired kilns, he described a six-chambered one of his own design, and pointed out that the initial error made in firing was in giving too much gas. After persistent reduction in quantity, however, he said they produced excellent results. Everything depended upon the man at the producer, and it must be worked to a nicety. The difficulty lay in the production of gas which was perfectly uniform in quality and quantity, so that the proportions of gas and air remained constant. He preferred to regulate the supply of gas, leaving the air constant, rather than attempt to modify the relative amount of both. They found that the colour of the pieces was better than in those from the coal-fired kilns, the purity of the white body and glaze more brilliant, and the fusion of it more perfect; so that, generally speaking, the results were superb. In this kiln there was a saving of 15 per cent. over the coal-fired continuous kiln, and of 65 per cent. over the ordinary intermittent kiln.

A short discussion followed the lecture; and a vote of thanks was accorded to Mr. Ansell.

A RAPID METHOD OF INFERRING THE CALORIFIC AND ILLUMINATING POWER OF COAL GAS.

Part IV. of the "Journal für Praktische Chemie" of this year contains an article by Herr Nicolai Teclu, on a method which he has devised for the rapid estimation of the calorific power and, incidentally, of the illuminating power of coal gas. The method is indirect, depending on the fact that the calorific power and the tension or explosive force exerted by a mixture of gas and air on explosion are both dependent primarily on the temperature of combustion of the gas. Consequently, the explosive force of such a mixture may be applied to the deduction of the calorific power of the gas in the mixture.



The investigations were carried out in the Chemical Laboratory of the Commercial Academy at Vienna; and the apparatus used is a modification of one devised by Herr Teclu in 1907 for a series of experiments on the explosive limits of mixtures of air with hydrogen, methane, coal gas, and acetylene. The modified apparatus now used, which is made by the Vienna firm of Rohrbeck, is shown in the annexed figure. It consists of the glass globe A, of 1 litre capacity, with three tubulures each 2 c.m. (0·8 inch) wide. The tube B, 35 c.m. (13¾ inches) in length and 1·2 c.m. (½ inch) bore, is fixed by means of a cork tightly in the upper tubulure; while the upper end of the tube C, which is 12 c.m. (4¾ inches) long and 1 c.m. (0·4 inch.) bore, enters the lower tubulure. This tube has a side arm M, with glass tap K. The lateral tubulure D of the globe is narrowed at its mouth to 0·8 c.m. (⅓ inch). The cap E, forming the bob of the pendulum F, fits loosely over the mouth of the tubulure D. On the pendulum rod above the cap E is an aluminium ring G, with a pointer traversing (when the pendulum swings out) the millimetre scale shown on the quadrant. The scale extends from 0 at the base of the quadrant to 500 m.m. at the top. There is a stop to prevent the pendulum swinging back in the opposite direction. The lower end of the bottom tube C is connected to the gas supply; and the test is made in the following manner.

A deadbeat seconds clock is started at the moment the gas is turned on to C; the tap K being closed. After a few seconds, the gas escaping through B is lighted and burns at the top of the tube. A small proportion of the gas also escapes through D. The gas supply is turned off in exactly 30 seconds. The flame at once begins to diminish in size, while air enters the globe through the annular space between the tube C and the lower tubulure of the globe A and, to a smaller extent, through the tubulure D. The flame gradually loses its yellow colour, becomes blue, and splits up. One portion of the flame remains at the mouth of the tube B, while the other portion descends with increasing velocity into the globe, where it causes an explosion. The resultant gases are thereby suddenly expelled through all the three openings of the globe. The portion of the gases which escapes through D gives an impulse to the pendulum corresponding in force to the tension or explosive force of the escaping gases. Though the pendulum is thus propelled by only a part of the total explosive force, this part is a constant proportion of the total for all tests made with a particular apparatus, provided no alteration is made in the parts of the apparatus between the tests. If necessary, the explosion may be regulated in the first instance by varying the length of the tube B. Otherwise, it is automatically regulated by the explosive limits of the coal gas; and, consequently, the impulse given to the pendulum is a measure of the calorific value of the gas.

The gas used in the trials was drawn from the supply from the Municipal Gas-Works of Vienna. Over 200 tests were made on the gas; and the results quoted in the paper show that the impulse given to the pendulum as observed on the scale varied from 248·5 to 271·5 m.m. Comparative tests were made on a mixture of equal volumes of hydrogen and marsh gas; and the corresponding readings on the scale varied from 245 to 250·5 c.c. It was found that corrections for variations of temperature, moisture, and barometric height could be dispensed with, as they only caused differences of a trifle over 1 per cent. Ten samples of coal gas were found to have a calorific value higher than that of the mixture of hydrogen and methane by the following percentages:—

8·24 0·77 2·79 1·78 8·24 2·58 8·04 9·65 0·97 0·36

Since the intensity of the light afforded by mantles depends on the temperature of combustion of the gas, the illuminating power must, Herr Teclu says, be directly proportional to the calorific power. Hence the apparatus affords a means of estimating the illuminating power of the gas when consumed under mantles, and even of the ordinary illuminating power, because the incandescence of the carbon separated in a luminous flame depends on the calorific power of the gas. When the gas was enriched by carburetting, it was observed that the flame took longer to pass down into the globe; but when it was reduced in quality by dilution with hydrogen, the flame descended more rapidly than before. Actually the time taken by the flame to burn down in the explosion apparatus described depends on the difference between the specific gravity of the gas and of air. The lighter the gas the more rapidly will it escape from the globe, and the more rapidly will air be drawn in, and consequently the flame will pass down more quickly. Observation of the number of seconds which elapse from the time the gas is cut off to the time of the explosion therefore affords a measure of the illuminating power of the gas.

This observation may be made along with the observation of the calorific power by means of this apparatus. The time which elapsed between the cutting off of the gas and the explosion was 27 seconds for a mixture of equal volumes of hydrogen and methane, and from 34 to 35 seconds for a number of samples of coal gas. In Herr Teclu's opinion, the ratio of the impulse given to the pendulum (as observed on the millimetre scale) to the time which elapses between the turning off of the gas and the explosion is a fair measure of the quality of the gas used in the test by reference to the corresponding ratio for a gas of standard quality. He considers that the method is as exact as most methods of technical chemical analysis; and the test occupies only a very few minutes.

After each test the globe is cleared of its gaseous contents by applying suction to the lateral tube M while the tap K is open.

In the paragraph in the last number of the "JOURNAL," notifying the election of Mr. Frank H. Jones as a member of the Institution of Civil Engineers, he was described as of Messrs. H. E. Jones and Son. This was due to a misconception. We learn from Mr. H. E. Jones that the partnership between himself and his son was, owing to the many separate engagements of the latter, put an end to four years ago, since which time they have worked quite independently, although their offices at Palace Chambers are the same.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Newcastle.

The Sixty-Fourth Half-Yearly Meeting of the North of England Gas Managers' Association was held in the Lecture Theatre of the North of England Institute of Mining Engineers, in Newcastle, on Saturday—Mr. W. FORD, of Stockton, the President, in the chair. There was a good attendance of members.

The PRESIDENT expressed his pleasure at seeing so many of his old friends, and likewise some new ones, present. Their bill of fare, so far as gas questions were concerned, was a very meagre one; but they had a gentleman with them who, he hoped, would make up for any defect on this point, and who, he also hoped, would do service to the members of the Association. He had had the honour during the year of having been invited to a considerable number of provincial meetings. Unfortunately, the state of his health did not allow him to accept any of them, with the exception of the last one—that of the Eastern Counties Association. He could assure them that at this meeting he never saw a more brotherly or friendly feeling existing. He claimed for their own Association that they gave every stranger a hearty welcome; but he could assure them that he received an exceedingly cordial one from the members of the Eastern Counties Association. He hoped that his successor would be able to pay more of these friendly visits to kindred associations than he had been able to do. He thought it his duty to explain why he had been at so few of the meetings. In calling upon the Honorary Secretary to read the letters which had been received from gentlemen who were unable to be with them, he mentioned that his old and especial friend Mr. Cox, of Sunderland, regretted to say that though it was his intention to be present, he was not able to do so. He regretted exceedingly Mr. Cox's absence, but hoped, as he was sure they all did, that he might be long spared to come among them.

The HON. SECRETARY (Mr. H. Lees, of Hexham) read a number of letters of regret he had received from representatives of other Associations and from members of their own Association. He also submitted the annual statement of accounts, which was unanimously adopted.

NEW MEMBERS AND ASSOCIATES.

The following were admitted to the Association:—

Members.—Mr. Charles Ford, of Amble, and Mr. William Siddle, of the Holderness Gas-Works.

Associates.—Mr. Charles F. Blincoe, of Middlesbrough; Mr. Percy T. Armstrong, of the Leeds University; Mr. J. Shield, of Hexham; Mr. W. A. Howie, of South Shields; Mr. Frank P. Lees, of Hexham; Mr. W. A. Duff, of Newcastle; and Mr. Michael A. Scott, of Middleton St. George.

LECTURE BY PROFESSOR BONE.

Dr. W. A. BONE, F.R.S., Professor of Fuel and Metallurgy in the Leeds University, then delivered a lecture, on "The Influence of Surface upon Gaseous Combustion," which will be found on p. 300.

At the conclusion of the lecture,

Mr. W. DOIG GIBB (Newcastle) said he supposed that most of them came there with the knowledge that Professor Bone had the superintendence of the general experiments that were being carried out for the Institution at the present time in Leeds University. They also knew him as a scientific lecturer; and therefore they were prepared to hear something out of the common run of the papers they had from practical men. He was sure none of them had been disappointed. It was, he thought, flattering to the intelligence of the North of England managers that the lecturer had been more suggestive than conclusive. They in the North of England provided a very high class of literary fare; and he was certain that Professor Bone's contribution to it would very worthily maintain their high standard. Therefore it was with great pleasure he moved that their best thanks be tendered to him for coming to them and giving them the lecture.

Mr. A. B. WALKER (Walker and Wallsend), in seconding, said that he, as had doubtless many of the other members, had the opportunity of hearing Professor Bone at the Institution meeting. He was sure they enjoyed that lecture, both as regarded the literary matter, and also the experiments; and that day Professor Bone had certainly kept up to the standard he then laid down. In both of the lectures, if they studied them, they would find matter which would enable them to explain a great many matters which they previously did not understand. He should like to say, on his own behalf, that the congratulations of the members were due to the President and the Committee for getting Professor Bone there that day.

The PRESIDENT conveyed to Professor Bone the sentiments of the Association; adding that he was sure they had all enjoyed the treat.

Professor BONE acknowledged the kind vote accorded to him for what, he was afraid, must have been rather a difficult subject to follow. He was very glad to appear before audiences who would listen with such attention as they had listened to him on subjects of this kind. He was not skilled in the arts of popular lecturing; and he did not practise them. Probably his temperament was not in that direction; so that, when he came to address audiences, he had to bring before them subjects which were not of a popular description. Therefore he often made very great demand upon the attention of his audiences. It had given him very great pleasure to make his first appearance before the Association; and he should look forward to meeting them again in a similar manner. But his pleasure, on this occasion, was very greatly enhanced by the fact that his old friend, Mr. Ford, was their President. Mr. Ford had known him, he might say literally, the whole of his life; and he was very glad indeed to lecture at a meeting presided over by him.

DATES OF MEETINGS.

The HON. SECRETARY, in the name of the Committee, moved a resolution to alter the date of the spring meeting from the last Saturday in April to the first Saturday in May, and to continue the autumn meeting on the first Saturday in October, with powers to the Committee to alter these dates under special circumstances. He said the Committee had asked the members to express their opinions upon the proposed change, and only one had done so.

Mr. G. KEYTE (Workington) seconded the motion.

The HON. SECRETARY having explained that the proposed change to the first Saturday in May was intended to meet the convenience of members in the matter of train arrangements, the resolution was unanimously agreed to.

THE LIVESEY MEMORIAL FUND.

Mr. T. H. DUXBURY (South Shields) proposed that the Association contribute twenty-five guineas to the Livesey Memorial Fund. Having, he said, observed the attention given to this matter by the Technical Press, it was quite unnecessary for him to attempt to eulogize the work done by the late Sir George Livesey, or to emphasize the necessity for a donation being given by the Association. As a matter of fact, the minimum required to complete the fund was £10,000, and he understood that, up to date, the figure realized was a little over £9000. Consequently, while the bulk of the money was already obtained, there was still a further sum required; and the Committee of the Association felt the members would like to do something in the matter.

Mr. J. LEWIS (Newcastle) expressed his pleasure in seconding the motion.

The PRESIDENT said the only difference of opinion upon the Committee was that some of the members would have liked to make the amount more. Therefore he had no hesitation in putting the motion to the meeting.

The motion was agreed to unanimously.

ELECTION OF OFFICERS.

It was reported that the ballot for office-bearers had resulted in the following being elected:—

President.—Mr. T. H. Duxbury, of South Shields.

Vice-President.—Mr. J. Lewis, of Newcastle.

Hon. Secretary and Treasurer.—Mr. H. Lees, of Hexham.

Members of Committee.—Messrs. C. H. Armstrong, of Walker and Wallsend; and Mr. W. Doig Gibb, of Newcastle.

Auditor (in place of Mr. Armstrong).—Mr. W. Garbutt, of Newcastle.

VOTES OF THANKS.

Mr. T. BOWER (West Hartlepool) moved a vote of thanks to the Committee and Scrutineers for their services, and also to the President and Council of the North of England Institute of Mining and Mechanical Engineers, for granting the use of their premises to the Association.

Mr. T. HARDIE (Redheugh) seconded the motion.

The PRESIDENT expressed his indebtedness to the Committee, and particularly to the Hon. Secretary, for the sympathetic assistance they had given to him in the work of the Association; and the motion was carried.

PLACE OF NEXT MEETING.

Mr. T. H. DUXBURY at this stage interposed to say that he wished to convey to the members his sincere thanks for doing him the honour of electing him their President. So far as their next meeting was concerned, he personally should take it as a compliment if they could hold it in South Shields; and if they should determine to do this, he was equally certain his Directors would be very pleased to see the Association once more down at the seaside.

It was agreed to accept the invitation.

Mr. W. HARDIE (North Shields), the Mayor of Tynemouth, proposed a vote of thanks to the President for his services during the year; saying he was exceedingly pleased to have the opportunity of doing so. The vote was in a double sense due to their friend Mr. Ford, because this was the second occasion on which he had filled the onerous position of President of the Association. He had filled it with, he thought, credit to himself, and, he was sure, with great satisfaction to the members. Mr. Ford gave them a very fine Presidential Address; and he would only like to say he considered the portion of it which referred to the past history of the Association—its formation and progress—would be a very

useful part of the "Transactions." There was no one more fit to do this work than Mr. Ford, because he was one of the founders of the Association, and he had been constantly in touch with it during all the years of its existence. He had been a worker for its good, both in the reading of papers and in other ways which had tended to the advantage of the Association.

Mr. J. WHYTE (Seaham Harbour) said he had much pleasure indeed in seconding the proposition.

The motion having been cordially agreed to,

The PRESIDENT referred to the flattering remarks which had been made about him by the proposer, and said Mr. Hardie's late father was his esteemed friend. Mr. Hardie and he doubtless had to do with the inauguration of this now successful Association. He thanked the members, not only for their vote on the present occasion, but for their election of him as President for a second time. He could assure them that it had given him immense pleasure and gratification to have held the office.

The meeting then terminated.

THE DINNER.

The members and friends, to the number of more than a hundred, dined in the Turk's Head Hotel—Mr. Ford in the chair. The toast of "The Association" was proposed by Professor Bone in an appropriate speech, and was acknowledged by the Chairman. That of "Kindred Associations" was submitted by Mr. T. H. Duxbury, and was responded to by Mr. Robert Watson, of Doncaster. The proceedings closed at an early hour.

COAL-GAS FUEL FOR MOTOR VEHICLES.

An apparatus for enabling compressed coal gas to be consumed in the cylinders of an engine designed to run on petrol is the subject of a patent recently granted to Messrs. Pearce and Climpson, of Hastings; and the construction of the device is shown in a diagram which appears in the current number of the "Commercial Motor." Its operation is as follows: Compressed coal gas, which is admitted from a steel cylinder through a jet, impinges on a conical baffle-plate, which splits up the single stream of gas into a number of finer streams that pass through a series of holes near the edge of the plate. The gas must then traverse a thick layer of steel parings (held in place between two plates of perforated sheet metal), and be further broken up by means of a sheet of wire gauze before it enters the expansion chamber. The objects of these baffles and gauze partitions are to secure the gradual lowering of the pressure of the gas as it leaves the cylinder, and ensure a steady flow of gas, at a low pressure, from the expansion chamber to the engine cylinders. As the gas issues from the former through a nozzle, the requisite quantities of air for combustion are admitted through ports, the sizes of which may be regulated by means of a sleeve.

A representative of the above-named publication went to Hastings to witness some tests with a four-cylinder petrol engine to which the device was fitted. It was an old 24-30 H.P. Duerkopp engine, and it had seen much service on an old London Road Car motor-bus. According to the account furnished to our contemporary, the gas was compressed to 120 atmospheres (1800 lbs. per square inch) in a steel cylinder 5½ inches in diameter and 50 inches long, and containing 60 cubic feet. A reducing-valve was fitted to the cylinder, and the pressure of the gas was reduced to 20 lbs. per square inch before reaching the nozzle.

The average of a number of tests shows that 70 cubic feet of gas will, in the engine mentioned, give out the same amount of work as is obtained from a gallon of petrol. At the present prices for coal gas compressed to 120 atmospheres, the engine costs much more to run on gas than on petrol; but it has been ascertained that, provided the demand were sufficient to keep a compressing plant fully employed, the gas could be compressed into cylinders to the required pressure at a rate not exceeding 5s. 6d. per 1000 cubic feet, including the price of the gas before compression. At this rate, compressed gas fuel is equal to petrol at 4·68d. per gallon. The size of a cylinder capable of holding 600 cubic feet of gas compressed to 120 atmospheres, is 15 inches in diameter and 7 feet long—a convenient size to be stowed away under one of the inside seats of a motor omnibus.

It is acknowledged that there is no novelty in the idea of employing compressed coal gas as fuel for self-propelled vehicles. There have been, in this country and on the Continent, many attempts to run tramcars with internal combustion engines consuming coal gas; and it has been found that the system can be worked very economically. Our contemporary does not see any serious obstacle in the way of its successful operation with motor omnibuses or motor vans in the engines of which coal gas is being consumed.

At a recent meeting of the members of the Institution of Municipal Engineers resident in the northern division of the home counties district, which includes Bedford, Buckinghamshire, Essex, Hertfordshire, and Middlesex, Mr. Henry C. Adams, Assoc.M.Inst.C.E. (Messrs. Henry Adams and Son), was elected Chairman of the District Committee and a Member of Council of the Institution, and Mr. Bernard Partridge, of Walthamstow, Hon. Secretary. An Executive Sub-Committee was appointed.

THE INFLUENCE OF SURFACE UPON GASEOUS COMBUSTION.

[A Lecture by Professor W. A. Bone to the North of England Gas Managers' Association, May 1.]

Professor W. A. BONE, D.Sc., F.R.S., of Leeds University, in the course of a lecture to the North of England Gas Managers' Association at Newcastle last Saturday, said:

May I offer a word of explanation of my choosing this subject? The reasons which have led me to select it are two-fold. In the first place, the subject of surface combustion is one which is at the present moment creating a great deal of interest among chemists, particularly on the Continent, and I believe is likely to prove of extreme interest and value in technology. It is a subject which, so far as modern investigation goes, is somewhat in its infancy; and I propose to speak, not so much about what has been accomplished, but rather to follow the direction in which inquiry has been put forward, and the kind of results that may be expected to accrue. At the same time, the subject is at present in what I may, perhaps, term a theoretic stage; but I think there are certain advantages in taking a question of this kind, and expounding it to men engaged in the more practical side of gas manufacture and combustion of gases. There are frequently very valuable side-lights thrown upon every-day practice by the results and direction of current scientific inquiry; and I have deliberately selected this subject, in order to bring before you those points which, I hope, some of you may find valuable as side-lights upon practice. Many people look in a lecture rather for accomplished results directly bearing upon practice, and which they can immediately apply. I think there is a great deal to be said for a subject which will cause people to think, and which may explain some of the hidden difficulties which they encounter. In the second place, the subject has the advantage, to me personally, of being one on which I have been working for some years. We, unfortunately, often have to talk upon matters of which we know very little, or only by reading or hearsay; and it is an advantage to be able to speak about a subject from the inside, so to say.

You may, perhaps, better understand what I mean by surface combustion if I review the early history of it. For this, we must go back about a hundred years, to the classical researches of Sir Humphry Davy, because it was in the course of those researches that the phenomena of surface combustion was first discovered. After experiment upon the ignition-points of explosive mixtures, Davy found, what is now a matter of common knowledge, that the elements of a combustible mixture will combine, with a fair velocity, at temperatures considerably below the ignition-point, without any apparent flame. Having thus demonstrated the occurrence of flameless combustion as a general phenomenon within a fairly wide range of temperature below the actual ignition-points of mixtures, he was led to ask the question whether, seeing that the temperatures of flames far exceeded those at which solids became incandescent, a metallic wire could be raised, and maintained, at incandescence, by the slow combustion of gases, without actual flame, but producing heat enough to keep the wire ignited. No sooner was this question asked, than he submitted it to the test of experiment. He plunged a hot spiral of platinum wire into a jar containing a mixture of coal gas and air, rendered non-explosive by an excess of combustible gas. The wire at once became red hot, and remained so until nearly the whole of the oxygen in the mixture had disappeared; the gases, of course, combining on the surface of the wire, and the heat of the combustion being sufficient to maintain a state of incandescence. On removing the wire, the glow ceased. On placing it in another jar, with a smaller mixture, the glow re-appeared, and did so practically as many times as he wished. Subsequent experiments proved that hydrogen was far more susceptible of surface combustion, in contact with platinum, than either ethylene or carbon monoxide; and that whereas platinum and palladium had the power of inducing surface combustion in an eminent degree, such metals as gold, silver, iron, or zinc—being either inert or only feebly active—were only feebly acted on in this sense. Such is the mutual activity of hydrogen and platinum that Davy was able to demonstrate, in lectures at the Royal Institution, the ignition of a jet of hydrogen when it was made to impinge upon a warm spiral of platinum; and in the following year—1818—Erman succeeded in exploding a charge of electrolytic gas, simply by bringing it into contact with a spiral made of platinum, heated to a temperature of 50° C.

Seven or eight years afterwards, the subject was elaborately investigated by Delling, in collaboration with Thénard, and independently by Döbereiner. The results of these experiments showed that the power of inducing surface combustion is possessed in varying degrees by all solids, according to their specific character—their state of diffusion upon a point of surface of a given mass, and according to the temperature. Platinum, in a state of thin division, will cause a combination of hydrogen and oxygen to take place at ordinary temperatures; finely-divided silver at 150° C.; and gold-leaf, at 260° C.; while non-metallic substances —such as charcoal, pumice stone, porcelain, rock crystal, and broken glass—become active at a temperature of 350° C. In the case of glass, it is found that angular pieces are, approximately, twice as effective as spherical masses of equal surface; and that the roughness of the surface considerably aids activity.

As to the cause of these various phenomena, Döbereiner showed

that freshly prepared platinum-black absorbed oxygen from the air; and that when it was charged with oxygen and plunged into a jar of hydrogen formation of steam ensued. He found that the operation of alternately charging the metal with oxygen, and then burning away the oxygen in hydrogen, might be repeated a great many times. He concluded that the function of the platinum was to act as a carrier of oxygen to the hydrogen; the catalytic combination being essentially a series of rapidly alternating oxidation and reduction. This view—which was very commonly held, and is still by a very large number of chemists, but which, I think, has been found to be not in accordance with fact—was very strongly opposed by De la Riva, in a controversy with Faraday in 1835. Faraday, while not denying the fact—which cannot be denied—that finely-divided platinum absorbs oxygen, and that an oxidized or oxygenated sponge is reduced by hydrogen at temperatures not much higher than the ordinary, argued that surface combustion is a phenomenon quite distinct from that of the action of a wire, or tin foil, upon a mixture of the two gases. The function of the metal, in the true catalytic combustion (which, perhaps, I may be able to explain later), he thought was to simply condense both the metal and the combustible gas at the surface, thus producing a condition at the surface layer comparable to that of high pressures; so that the effect of introducing a strip of platinum into a combustible mixture might be considered analogous to that of forcing the layer of gas immediately in contact, as if we had a mixture and applied pressure to it, and the cause of combination at the surface was simply a case of combustible gases being present in high concentration at the surface.

Another version of the condensation theory, and one which seems more in accord with the facts as they are now coming to be known, was brought forward by the Italian physicist Fusinière, in the year 1825; and it is rather an interesting view. His idea was that it is the combustible gas only, and not the oxygen, which is condensed at the surface; and that the combustible gas is, by some action at the surface, which he did not profess to understand, rendered more than ordinarily active, and then is simply burned by the oxygen. This view, as it might be applied to the case of the combination of hydrogen and oxygen in contact with platinum, derives considerable support from the researches of Thomas Graham on the occlusion of hydrogen by metals, and particularly by those of the platinum group. No doubt most of you are aware that the metal palladium possesses the power of occluding hydrogen to quite an extraordinary degree, at ordinary temperatures. It will occlude 950 times its own volume; and even at the temperature of boiling water, it will occlude 650 times its own volume. Platinum, while it is much less active, is still an active occluder of hydrogen; and many other metals possess this power, at moderately high temperatures. All metals which occlude hydrogen are also capable of allowing hydrogen to pass through them red hot. The view is, therefore, that the surface combustion in the case of hydrogen is due primarily to the occlusion of the hydrogen by the metal, and that the occluded hydrogen is in a form more active than ordinary hydrogen.

In common with this view of Fusinière, William Henry found that, when a platinum ball is immersed in an equal volume of electrolytic gas and ethylene, the hydrogen and the oxygen alone combine. There is no combination of the hydrocarbon gas at all, unless the mixture contains a much larger proportion of oxygen. This result, which has an important bearing upon the methods of analyzing and separating gases, was afterwards confirmed by Graham. It is, therefore, clear that during the period between the years 1816 and 1836, which immediately followed the discovery of surface combustion by Davy, the subject engaged the attention of some of the most eminent experimentalists of the day. It was established, beyond question, that all solids have this power of inducing, or accelerating, combustion, under suitable conditions. It was recognized that, in the case of metals, those which are the most active are precisely those which in the most marked degree possess the power of occluding hydrogen. But experiments had been conducted solely with mixtures of hydrogen and oxygen. Other gases had not been studied; and no general effort had been put forward. After the year 1836, the interest in the subject waned, and was not revived for a period of about sixty years.

After this brief historical introduction, and before dealing with the results of recent investigations, I may appropriately offer a few general observations as to the significance of surface action in relation to chemical changes in gases, in view of the importance of the close study of the factors governing such matters, from the point of view of their technical application. It is now generally recognized that heated surfaces have a very marked influence in accelerating, not only combustion, but chemical interchanges in gases generally. The common view, though there are facts which we might call in question—what may be called the orthodox view—is that this action of surface is mainly an accelerating, and not directive, action; or, in other words, the gaseous system (where it consists of a simple gas) is not in a state of stable equilibrium, and is therefore liable to change. The introduction of a hot surface will merely accelerate the movement towards a state of stable equilibrium, but will have no influence at all upon that final state. In the generation and in the application of gaseous fuels, we have to deal, not only with combustion, including the interaction of the products of complete combustion, where the supply of oxygen is deficient, but also with the decomposing of the gases, and dissociation phenomena; and the action of hot surfaces accelerates all alike. It is clear, therefore, that in all industrial heating operations, which are more or less necessarily conducted in furnaces enclosed or bounded by solid walls, and also more or less packed with solid materials, the question of the influence of hot solids at once assumes an importance which, though it is often overlooked, can hardly be over-estimated, in dealing with the applications of gas for heating purposes. I had the pleasure of showing, at the meeting of the Institution of Gas Engineers in London last June, how surface accelerates the decomposition of methane, when at high temperature. I pointed out then the function of the charge in retorts, of the hot tar, and the heat of the walls of the retort, in promoting the decomposition of methane into carbon and hydrogen; and I was able to show experiments bringing out this fact. That is only one instance—many could be cited—and one which, of course, applies equally to the gas industry, of the importance of taking into account the heat of surfaces in considering gaseous interchanges.

We have to regard hot surfaces, then, as accelerators of combustion, and as radiators. When we speak of flame we are dealing with a case of explosive combustion. We are apt, on account of the very short duration of flame, to speak of the interaction of ordinary flame chemical changes as being instantaneous; and no doubt when measured by the ordinary gross units of time which we adopt in ordinary communications, the change does seem instantaneous. But it only appears instantaneous because we use far too large a unit of time. We have to consider, in regard to combustion, not the units which are ordinarily adopted, but units comparable to the time which elapses between two currents of molecules in a gaseous mixture. That is what we may call the molecular unit of time. It is an exceedingly small unit; but if we were able to appreciate these short intervals, we should find, in a flame, that the chemical changes are comparatively slow—at any rate, in ordinary flames—and that there is plenty of room for great acceleration of that change, even though it will appear to us as insufficient.

I want to convey to you the idea that, even in a flame, we must regard certain chemical changes as slow, when compared with what may be produced under suitable conditions. If you appreciate this fact, you will see that, even with regard to combustion, we might have, in actual flame, plenty of room for an accelerating action, if a substance can be found to accelerate the combustion. That is precisely what the influence of a hot surface is. Therefore, if we have a mixture in process of combining, brought in contact with a nearly red-hot solid, combustion takes place with greater rapidity in the neighbourhood of the solid than it does in the atmosphere which is outside the surface, and the heat is developed at that surface more rapidly, and so you get greater intensity. Therefore the surface becomes, by its function of giving out radiant energy, a further important item in the operation of heating.

It is not my purpose to discourse at all upon the importance of radiation as a means of heating, except to say that probably the importance of radiation in furnaces, heating by gas-fires, and so forth, has not received the attention which it really deserves. Some twenty years or more ago the late Mr. Frederick Siemens, in his efforts to bring furnace construction into more scientific lines, emphasized the opinion that the proper heating in a furnace is entirely due to radiation, in contra-distinction to actual flame-contact. I think we are coming down to the other view, that the objective aimed at must be to get the greatest efficiency out of heating by gas, and is, in my opinion, to introduce as much surface combustion as possible—that is to say, to throw the combination of gases as far as practicable, or get the combination to take place as far as possible at the contact with the hot surface, and to heat them up by surface combustion to a high temperature, so as to get the maximum amount of radiation. And when I remind you that the action of radiant energy from a hot surface is proportional to the fourth-power of its temperature, you see the very great importance of localizing, as far as may be, the combustion upon the surface, so as to get the highest possible temperature there.

During the past ten years, a good deal of investigation has been made, not simply in regard to surface combustion, but also with reference to the action of surfaces in inducing dissociation phenomena, and their action in rapidly accelerating chemical equilibrium in gaseous mixtures. The view which has been put forward—which is due to the German chemist Nernst—is that you may consider that the action at the surface, whether it be by combustion or dissociation at the hot surface, occupies a time which is infinitely short, as compared with the velocity at which the gases will diffuse on to the surfaces, or the products of combustion, or dissociation, will diffuse away from the surface. Consequently, the controlling factor of the process is the rate of combination of the gas on to the surface. This theory is partly right and partly wrong. I quite agree that we may regard the combustion at the surface as occupying an exceptionally small amount of time, and that, therefore, we cannot measure it; and that the actual controlling factor is something else. My experiments show that this controlling factor is not diffusion, but, as we shall see, something quite different.

I thought it might possibly interest you if I explained, by means of slides, the manner in which knowledge of surface combustion may be applied—how investigation may be governed, and the factors controlling it be determined. The way in which the thing must be carried out is to determine the rate of combination of different combustible gases with oxygen, when the reacting mixtures are brought in contact with various solid surfaces, at

selected constant temperatures. For this purpose, it is necessary to select a fairly low temperature, for two reasons—first of all, so that the velocity may be conveniently increased; and, secondly, that the surface combustion shall not be accompanied by any change in the main body of the gas which is in actual contact with the surface at any given instant. When you take a mixture of combustible gases, it may be a considerable distance below the ignition-point, and put them in an ordinary glass vessel, you may keep them weeks or months without noticing any change in them. But when you introduce some of the solid substances we have been mentioning into the vessel, you at once find a change, which may be measured. We may take a gas mixed with pure oxygen only, before we begin to consider mixtures containing two or three gases. I will explain the experimental method by means of a slide. The slide shows you the apparatus, including a gas-furnace, which can be maintained at a constant temperature for weeks together. In this furnace is laid a long glass tube, drawn out at each end, and hermetically sealed. The tube contains the solid substances; and the gas circulates rapidly over them. The rate of change is indicated by the rate of fall of temperature in the apparatus. In some of the experiments it is necessary to take off samples of the gases at various intervals, without disturbing the contents of the apparatus. For this purpose, we have a series of bye-pass tubes. We have investigated very thoroughly mixtures of hydrogen and oxygen; and the results of these investigations have been published in the "Transactions of the Royal Society," in which the full details can be studied. But since they were published, we have investigated many other mixtures.

In the case of hydrogen and oxygen, the mixture is, in many respects, one of the simplest and most suitable for a lecture of this sort. To get any general idea of the temperatures operating in surface combustion, it is of no use merely to experiment with one surface. We have investigated a great variety of surfaces. For instance, we have taken porous porcelain, or substances very similar to it, fire-clay, which is a highly silicious substance, and is practically free from materials, such as ferric oxide, which we want to avoid. Then, as representing the basic varieties, we have taken magnesia; and as representative of metals which are either non-combustible or nearly so, we have taken gold, silver, and platinum, and iron, copper, and nickel. Then it was necessary to examine materials with easily reducible surfaces, such as ferric oxide, nickel oxide, and copper oxide. Finally, we hope to take those very unique substances of the rare earths which are used in the manufacture of incandescent mantles—viz., cerium and thorium. We have not yet reached this stage; but we trust we shall do so; and the results may have some bearing upon the use of the incandescent mantle. In the case of hydrogen and oxygen, the temperature varied, with platinum, from 160° to 460° C.; with porous porcelain and magnesia, it was 430°; with silver, 400°; with gold, 250°; with nickel, 230°; with copper, 204°; with oxide of nickel, 160°; and with oxide of iron 200°.

In the case of either an oxidizable metal or a reducible oxide, a temperature must be selected at which no permanent oxidation or reduction of the surface takes place. Selecting the case of hydrogen, for which, fortunately, very complete data are now available, we find, first, that the catalytic power of a given surface usually increases up to the state of maximum value, when successive charges of the combustible gas, united with the proper proportion of oxygen for complete combustion, are circulated over it; and that the rate of combination of the gases is strictly proportionate to the pressure. Two interpretations are capable of such a result. Either the rate of combination in the surface layer is infinitely greater than the ratio at which either the hydrogen or the oxygen can diffuse on to the surface from the external atmosphere, or than the steam produced in the combination can diffuse away. So that the actual rate observed depends on the number of molecules of oxygen which arise at the surface by diffusion from the surrounding gas, in a unit of time; and this, in turn, may depend on the practical pressure of the oxygen in the surrounding gases, at any given moment, which, as the gases are present in their combining rates, is always one-third of the total pressure of the mixture. The function of the surface, therefore, is to render one or other of the gases active, by loosening or dissolving the bonds which hold the atoms in the molecule together, so rendering it an easy prey to the action of the other gases. If, then, the rate of combustion in the surface layer is infinitely great, compared with the rate at which the particular gas concerned is rendered active, the actual rate observed will be proportional to the pressure of the latter.

When we come to examine mixtures containing the combustible and the oxygen not in combining proportions, but in other than combining proportions, if we began (say) with an excess of hydrogen—three of hydrogen to one of oxygen—as the oxygen disappears during the course of the experiment, the amount of the excess of hydrogen goes on accumulating, and you get a larger and larger excess of hydrogen as the experiment proceeds; and therefore you are able to value the effect of a gradually increasing excess of hydrogen. We find this very striking and significant fact, whether we start with an excess of hydrogen or whether we start with an excess of oxygen—that the governing factor in the analysis of the surface combustion is not the pressure of the oxygen, but the pressure of the hydrogen. A further thing we have proved by experiment is that, if we start with an increase of hydrogen, not only is the resulting velocity increasing, but the velocity with which we started is bigger; and this faster velocity is continually being accelerated. This means that somehow the gradually increasing excess of hydrogen is greatly due to the disappearing excess of oxygen. Thus you see that the excess of oxygen, so far from accelerating or stimulating the surface, is actually making the surface less active. This we found to be also true in the case of carbon monoxide. It is not the oxygen which is the governing factor, but the carbon monoxide; and I believe that it will be true of all combustible gases, that the oxygen has nothing to do with determining the velocity. This at once disproves the idea of Nernst, that the velocity is determined by diffusion factors, because, if this idea were true, then it would follow that the velocity must be proportional to the gas which is in defect at the surface.

These results suggested to us the fact that hydrogen should have a stimulating effect upon the surface under combustion. We therefore proceeded to investigate how the activity of the surface varied according to the nature of the atmosphere to which it had previously been exposed. Our experiments ultimately proved that the stimulation of the velocity, and the change, was due to the activity of the occluded hydrogen itself, or to something which happens to the properties of the surface at the moment of the occlusion of the hydrogen. It is not quite clear what it is. The experiments with copper oxide were of considerable interest. Copper proved to be a very much more varying catalyst than its oxide—a circumstance which we did not expect to find—both as regards the combustion of hydrogen and the combustion of carbonic oxide. We took a piece of copper gauze, and tried the velocity, during combination, of the gases, over the gauze; and also in the case of its oxide. In both instances hydrogen was the controlling factor. The oxide proved to be active to only about one-eighth or one-tenth the extent of an unreduced metal. We discovered here a fact which is of very great interest, and which I do not yet, perhaps, quite understand, though I hope to in a short time. Experiments with a mixture of hydrogen and oxygen in their combining proportions, and with hydrogen and nitrogen, showed clearly that we have nothing to do with oxidation of the surface in a retort, as is commonly supposed, because, if it depends on the radiation from that surface, say in the case of copper oxide, then the rate at which the gases begin to combine should be proportionate to the rate at which these gases would be reduced by pressure. The extraordinary thing we found here was that, when we take oxygen and nitrogen, we get a very much faster rate of steam formation. The surface is reduced and steam formed at a greater rate than when we take hydrogen and oxygen over the surface. The oxygen actually protects the surface from reduction by the hydrogen. When oxygen is present to any great extent, the rate is proportional to the pressure of the oxygen, not of the nitrogen—which is different from all the other substances. The oxygen condenses on the surface of the gauze, and actually protects the gauze from the reducing action of the hydrogen; and what we get is not the reduction of the gauze by hydrogen at all, but a combination of hydrogen and condensed oxygen—proving that the hydrogen never got to the surface at all. That is a very extraordinary result; and it is sufficient in itself to disprove the idea that surface combustion has anything to do with the alternating rate of gases over the surface.

It has been proved by experiment that a hydrocarbon, like marsh gas, is burned at a very much quicker rate than hydrogen—twenty or thirty times the rate of hydrogen—and when you introduce a solid surface, so great is the action of that surface upon hydrogen that the action is reversed—in fact, the hydrocarbon is almost left untouched. This reminds me of a rather puzzling fact I came across some time ago, which may be of interest to you. I had occasion to make an analysis of coal gas (a gas where air was drawn through the retorts); and there was a large percentage of nitrogen in the gas—an average of 17 to 20 per cent. I was much struck with the fact that the marsh gas was normal, and that it was the hydrogen which was in defect. I was for a long time unable to explain, or to form an idea in my own mind upon, this subject. When we started on the experiments on these selected combustion surfaces, we found that when we introduced the solid substance hydrogen went before marsh gas. This is just one way in which we may explain processes. I do not suppose that anyone here ever gets so much nitrogen in gas sent out, or is likely to; but still it may occur in accidental circumstances. This is just one instance in which these experiments have thrown light upon subjects in which you are very greatly interested.

As a general result of the experiments, we have disposed of the idea that surface combustion consists of a rapidly alternating series of explosions and reductions of the surface. The combustible gas, in most, if not in all, cases, is in some way, either by direct contact with the surface or by some influence exerted by the surface on the volume of gas not actually occluded, but outside, rendered active, and is then burned with extraordinary swiftness; and in some cases, probably that of copper, it is the oxygen which is thus influenced.

I think we have now to study the electric condition of that surface, because we have found that during the experiments, at any rate, metallic surfaces become charged with electricity. What the nature of this is, I cannot say; but that is the direction of the development in which we are to work immediately. The rate at which the activated combustible gas is burned is relatively very great, compared with the rate at which it is rendered active; so that the controlling factor in the process is not the actual rate of combustion at the surface, but the rate of activation of the com-

bustible gas which is brought into contact with it, and which is in time proportional to its pressure. This contention has been supported by a great many experiments, in which it was found that metallic surfaces have a very remarkable property, and particularly nickel, in rendering hydrogen active at a comparatively low temperature.

This has been adopted in commercial practice, in the working up of coal-tar products. The reactions are carried out by passing the gases or substances you want to hydrogenate over a nickel surface, in a fine state of division, at the low temperature of about 70° C. In such an experiment, you get benzene reduced to aniline. The most remarkable result, to my mind, is that you can completely change the mixture of carbonic oxide, with three times its own volume of hydrogen, into marsh gas and methane, at 250° C. So you will see that these experiments have abundantly proved that hydrogen in contact with nickel is abnormally active. I think that the explanation of this activity of surface will ultimately be found to be connected with the electric properties of these substances at high temperatures, and be associated with what is now well known of the discharge of negative corpuscles from heated surfaces. It is found that the rate of discharge is something like 25 times greater in hydrogen than without it. This points to some very intimate connection between the presence of hydrogen at the surface, or occluded at the surface, and the electric discharge. I believe that in this direction we shall be able to find a solution of these problems.

MANCHESTER AND DISTRICT AND YORKSHIRE JUNIOR GAS ASSOCIATIONS.

Joint Meeting at Rochdale.

A much enjoyed and altogether admirable feature of the working of these two Northern Junior Associations is the joint visit made every May to some works on the alternate arrangement of the two Councils—usually in their own county. On the present occasion, Rochdale was the town chosen; and Saturday last saw the members mustering in very large numbers at the *rendezvous* in the Town Hall. Everything that could be done to heighten the significance of the visit, and add dignity and grace to the civic welcome was done; and the noble and richly-adorned hall presented an animated spectacle when the Mayor (Councillor Wilson Dunning), accompanied by his niece the Mayoress, Councillor Walker, the Chairman of the Gas Committee, several other members of that Committee, and Mr. T. Banbury Ball, the Gas Engineer, ascended the platform.

Welcome by the Mayor.

The Mayor said that they all realized that no long speech was necessary or desirable at this stage of the day's proceedings. He had been asked to come and welcome them on behalf of the Rochdale Corporation, and especially of the Gas Committee. He had the greatest pleasure in extending them a very cordial welcome, and assured them that Rochdale felt honoured at having been chosen for the combined official visit. The Corporation were happy in possessing an excellent Gas Manager who was going to superintend the arrangements for their visit to his works, and who would give them all the special information they desired. That being so, it relieved him (the Mayor) of the necessity of saying much about the works. He did not claim they would get great benefit from inspecting the works; but they could not fail to profit from meeting together thus and exchanging views. He held strongly that such technical gatherings in any industry resulted in great benefits, not only to the individuals, but to the communities they served. Their works had been going for some considerable time; and, consequently, some portions were partly out of date. They did not believe in reckless or premature reconstruction, but tried to make the most of existing arrangements to work economically and to secure good results. Alterations of the older part of the plant were in view; and extensive though they would probably be, they hoped they would be in every way a benefit to the undertaking, and consequently to the town at large. As a Corporation, they owned the gas, water, and electricity works and the tramways—all of which he esteemed to be legitimate enterprises for a municipality. But he held that the present inhabitants and those who availed themselves of these services must not grasp at all the profits; the community as a whole, and not merely in any given years either, were entitled to the advantages and profits. Too often nowadays they heard the cry that all gains should go first hand to the inhabitants and consumers. He deemed such a plan bad, because to spend capital instead of interest would soon bring them on to the rocks. Lastly, he would invite them, so far as their time permitted, to see some of the other features of their municipal work, and particularly to notice, in close proximity to the Town Hall, how they were preparing to cover in further stretches of their not too alluring river, so as to secure readier access to the district on the other side. They would see that the town had already secured one grand open space in this way, and the tramways a most convenient centre. They might also be interested in the three bridges in ferro-concrete thrown over the river between the Town Hall and the gas-works.

Mr. F. Thorp, the Vice-President of the Manchester and District Association, and Mr. H. Butterfield, the President of the Yorkshire Association, voiced the thanks of the members for the honour paid them in their reception and welcome by the Mayor, and for the privilege of visiting the gas-works—promising that full advantage would be taken of the opportunity.

Visit to the Gas-Works.

The company then walked down to the gas-works, where they were divided up into four parties, who were guided round by Mr. T. Banbury Ball, the Engineer, Mr. Stenhouse, the Corporation Chemist (who has charge of the tar and sulphate plant), Mr. Mellor, the Assistant-Engineer, and Mr. Handley, another member of the staff. An illustrated souvenir of the works had been distributed among the members; and as this contained a plan of the works, it made the inspection easier than would otherwise have been the case in the somewhat limited time available.

The manufacture of coal gas in Rochdale dates from 1824. In the preceding year a Company was formed, and an Act of Parliament obtained for the purpose of supplying gas to the town and neighbourhood, which stipulated that the Company should supply "a cheaper and better light than could be obtained from oil-lamps." This Act received the Royal Assent in May, 1823. The limits of supply were a mile-and-a-quarter in every direction from the centre of the old Market Place. The works were erected in 1824, on a small portion of the present site. The Chairman of the Company, Mr. John Roby, a local banker and author, ventured to make a balloon ascent on the occasion of their formal opening. The capital of the concern was £12,000. The Company had not a very long existence; for on applying for additional capital in 1844, opposition was offered by the Rochdale Improvement Commissioners, and the contest ended in the Commissioners being authorized to acquire the Company's undertaking for £26,500, which, with £1200 costs, brought the original capital of the publicly-owned works to £27,700. The works were among the earliest gas-works to pass under municipal control. Rapid expansion of the business took place, followed naturally by reductions in price. In the first complete year under municipal control, the gas made was 27,919,000 cubic feet, and the consumers numbered 904; whereas last year these figures had reached 608,436,000 cubic feet and 29,630 consumers. Many as have been the alterations, additions, and improvements carried out on the works, one serious disadvantage has not been overcome—viz., the lack of railway connection, all coal having to be carted on to the works. More than thirty years ago, parliamentary powers were obtained for the removal of the works to a new site adjoining the railway; but as large sums of money had just previously been expended on the existing works, such strong opposition was manifested to the proposed removal that the scheme was abandoned.

The average daily production of gas in mid-winter is about 2¾ million cubic feet; and at the time of the present visit about 1¼ million cubic feet are made per day. Rochdale was one of the first gas-works to try inclined retorts. A small house contains five settings of sixes, 15 ft. long and 21 in. by 15 in. ⌂-shaped, which were installed in 1890. Four years later, the present imposing retort-house was erected; and in it were placed 20 similar inclined settings of sixes, 15 ft. long and 24 in. by 15 in. ⌂ retorts, which carbonize 5½ cwt. charges in six hours. Strong testimony is afforded, by the apparent newness of the exterior of this building, to the absence of unnecessary smoke and dust about the works. As this house supplies the main part of the year's make of coal gas, it was carefully examined, and the usual drawing, charging, and furnace feeding operations watched. To avoid the common evil of leakage of air into the top of the combustion chamber around a badly-fitting charging door, with the consequent high local heating and general derangement of the heating arrangements, it was noticed that these doors were faced and fastened down just as mouthpiece-lids are.

Special attention was paid to the adjoining coal-stores. There is some 40 feet difference in the levels of the streets forming the approaches to the works at either end of the retort-house. Advantage has been taken of this fact to make a high-level entrance to the coal-stores from the Manchester Road at the south-east corner of the works. These stores lie along the full length of the retort-house on the charging side, and they have large ventilating window spaces opening on to it. The coal is never stored above the level of the sills of these windows; thus securing ventilation, and avoiding the extreme pressure and side-thrust that a greater depth than 24 feet of coal would occasion. A bucket elevator brings the coal from the breaker in the stores to the middle point of the retort-house, where it can be delivered into conveyors and stored in the usual overhead hoppers. The roof of these stores is a 40 feet wide level continuation of the entrance street (and itself roofed in for its full length) with shoots along each side, down which the coal is discharged from the carts into the stores. From the windows at the end, one looks down 40 feet into the street passing the main entrance of the works.

Crossing the fine, wide space known as the coke-yard (though on Saturday hardly any coke was visible in it), the old retort-house is reached. The modern house is cool and fairly roomy; but this is really spacious, and as it is only used in mid-winter, it is easy to understand the general desire to make fuller and better use of so much valuable ground-space. Here are housed 19 settings of seven horizontal retorts in a bed, ⌂-shaped, with circular mouthpieces, all direct-fired and hand charged. Originally six other settings existed; but they were removed to make room for a carburetted water-gas plant. Hydraulic stoking machinery was installed in the retort-house about 30 years ago; but the house

was ill-adapted for it, and the results were disappointing; so its use was soon discontinued. Abundant room exists opposite each face of the bench, and a large store of coal is here stacked to a height of some 11 or 12 feet. Mr. Ball almost apologized for bringing his visitors to see this part of his carbonizing plant. Since the erection of the inclined-retort house opposite, in 1894, which has ever since been in constant work, this venerable pile has only been used to meet the emergencies of the maximum mid-winter make. Even then, so antiquated a type of setting, now quite obsolete in up-to-date works of any size, is hardly to be commended, even as a make-shift, seeing that it is so uneconomical in fuel consumption and labour charges. It is expected that after one more winter's working all the house will be demolished; but no decision has been arrived at regarding the type of carbonizing plant that is to take its place. In one corner of the house stand two complete regenerator settings of horizontals (of different types), erected partly as an experiment in the earlier days of gaseous firing and when the extensions were being contemplated which afterwards resulted in the erection of inclined retorts, partly also as a full-scale experimental plant.

The last section of the gas-making plant consists of the carburetted water-gas sets erected in 1905 by the Economical Gas Apparatus Construction Company. There are two sets, each capable of producing 750,000 cubic feet per twenty-four hours, and room is left for a third set when, if ever, required. Steam is supplied from two Lancashire boilers, 30 ft. by 8 ft., working at a pressure of 120 lbs. per square inch; while the air-blast is furnished from twenty fans of the usual type, only operated by two 30 H.P. steam-turbines running at 1750 revolutions per minute. Each of the boilers and turbines is of sufficient capacity for both sets of generators, while the exhausters and pumps are also in duplicate. The scrubber and condenser are common to both sets; but they are large enough to suffice for both sets working simultaneously. The carburetted water gas is mainly used for enrichment—to bring the candle power up to 18 candles; and the quantity added to the coal gas does not usually exceed 25 per cent. At the time of the visit, one generator only was in use, and in eight hours it made its daily amount of 250,000 cubic feet. The steam-turbines have been found highly satisfactory and smooth, quiet, and reliable in working. To avoid creating a nuisance from the buzzing of the fans, especially as the works are closely surrounded with houses, this plant is not run at nights or on Sundays. The water-gas plant is provided with two of Waller's three-bladed exhausters, each capable of passing 80,000 feet per hour at 60 revolutions per minute.

Immediately outside the house stands the relief holder for the water gas, a three-lift holder of over 300,000 cubic feet capacity. Needless to say, so large a holder was not erected at the time, but was an existing holder utilized for this special purpose. To minimize the heavy back-pressure it would throw, the third lift is very seldom used. An incidental advantage secured by having so large a holder here is that, though the actual making of water gas may only extend over one shift of eight hours, the gas can be regularly withdrawn and mixed with the coal gas in an unvarying proportion all the twenty-four hours. The water gas is purified by itself, measured through a rotary meter, and finally mixed with the coal gas at the inlet of the station meter.

The exhausters for the coal-gas plant are of the Gwynne make; each pair being coupled direct to a horizontal engine and capable of passing 120,000 cubic feet per hour at 60 revolutions a minute. The condensers are of the vertical pipe type; and the washing plant consists of two tower scrubbers, 38 feet high and 12 feet diameter, and a "Standard" washer-scrubber of 3 million cubic feet per day capacity. The purifiers consist of two sets of six boxes; one being 30 feet square, and the other 24 feet square. Four boxes in each set are worked with lime, and the two final catch-boxes with oxide. The smaller purifiers are usually worked in connection with the carburetted water gas; but the connections are so arranged that either kind of gas can be sent through.

One interesting relic of bygone experiments in purification was seen in the exhauster-house in the shape of the change valves and pumps of a Brin oxygen apparatus, which stands practically complete in an adjoining house. This oxygen was used for revivification of the oxide *in situ* without the disadvantage of the lowering of the candle power by admixture of the gas with the residual nitrogen. The results were not altogether satisfactory, especially from a financial standpoint, so the plant has had a long rest from labour. Though a derelict plant, it does not represent a dead capital charge, having been paid for out of revenue.

A Maxim carburettor is on the works for occasional use when enrichment is necessary and the price of oil or some other circumstance renders water-gas making inadvisable or impossible Benzol is used as the enriching oil, and comes from the works' own tar plant.

The holder capacity represents 3,612,000 cubic feet, and is equal to twenty-four hours maximum consumption. In addition to this is the carburetted water-gas relief holder.

The liquor is worked up into sulphate of ammonia; and this process, as well as tar distillation, has been carried on in these works for nearly thirty years. A steam-jet discharger is used to expel the salt from the saturator, and a Claus kiln, with its limestone scrubber and open oxide box, deal with the waste gases.

The tar is distilled in three 12-ton stills, direct-fired (with coal). The tar oils are collected in two fractions only; all the oils, after the light oils, being collected in one fraction and sold as creosote oil. Formerly when anthracene was marketable, other divisions of the distillate were adopted, and the anthracene cake extracted. The light oils are washed to remove and recover the carbolic acid, and then refractionated into three grades—viz., benzol, solvent naphtha, and heavy naphtha.

Mr. Stenhouse, who has charge of this branch, had arranged an instructive set of exhibits of all the liquor and tar products, the whole plainly labelled, and supplemented with scale models. Not only so, but equivalent quantities were exhibited together—*e.g.*, a gallon of gas liquor and the sulphate of ammonia it would yield, &c. The working of the Claus kiln and all the other parts of his department were explained *con amore;* and only the exigencies of a pre-arranged time-table prevented a longer stay here.

A return was made to the Town Hall, where a choice tea, provided by the Gas Committee, received ample justice. At the high table Councillor Walker, the Chairman of the Committee, presided, and supporting him were members of his Committee, and the Presidents and Secretaries of the two Associations.

Mr. James Taylor, the President of the Manchester and District Junior Association, spoke of his past associations with Rochdale and Mr. Ball. Then a comprehensive vote of thanks to the Chairman and members of the Gas Committee, and to Mr. Ball and his Assistants who had acted as guides was spoken to by Mr. Mosley and Mr. Hollingworth on behalf of Lancashire visitors, and by Mr. Cranfield for the Yorkshire contingent. It was pointed out that the attendance had suffered a good deal because of the visit clashing with the Gas Supply Examination.

After the resolution had been cordially passed,

Councillor Walker responded, and thanked the visitors on behalf of the Corporation and the Gas Committee. He was glad to hear their kind references to Mr. Ball and his staff, and appreciated these remarks. The members of the Corporation had a warm place in their esteem for Mr. Ball. He could assure them that they appreciated and valued him very highly. The members of the Council did not pretend to understand the technicalities of gas-works practice, nor did they imagine that it was for them to initiate improvements or developments therein—they simply tried to bring their common sense to bear on its business side and its policy. As they had seen, the works were old in part. They did not claim that they were model or show works; but they claimed they were doing the best with what they had got, and that they were making gas as cheaply as ever they could.

Councillors Sharp and Ogden next delivered interesting speeches, which were followed with keen interest.

Mr. T. Banbury Ball then rose to respond on behalf of himself and staff, and was received with musical honours. He protested that, after speeches from the Chairman and two other members of the Gas Committee, any words of his were unnecessary. He was pleased to acknowledge that in all his 27 years at Rochdale his experiences with his Committee had always been pleasant. Of all who were on the Gas Committee when he first knew it, no single one now remained on it. After 27 years experience of the Committee, he had yet to hear the first disparaging word about any advice he had to offer. He did not claim that his advice had always been accepted. He could not expect it; but when it had not been accepted, it had received earnest thoughtful consideration. In technical matters his Committee were content to be guided by the advice he had felt impelled to give, and to accept his view of what was best; but on matters of policy and finance, it was their prerogative to hear his opinion and advice, and then, as responsible custodians of the Corporation's assets, to take the step they considered best. The Chairman had emphasized the utilitarian and non-showy characteristics of the works; and this exactly hit off the situation. If the obsolete period of one of their retort-houses had been somewhat prolonged, it was only because municipal exigencies had prevented their earlier action. Still, he was sanguine that the preliminary steps to its reconstruction and modernizing would not be long delayed. They might see many places with more mechanical appliances; but he was one who thought that such should be rigidly restricted to cases admitting of their economical use. He saw no sense in doing by mechanical appliances what could be done by hand at half the price; and he had seen cases of mechanical application run mad. He had been very pleased to have the visitors at the Rochdale works, and his staff had equal pleasure in having done what they could for them. He was convinced that some points of interest could be found in even commonplace works, especially when visited in company with others who were ready to discuss what they had seen; and he was bound to say in justice to the many gas colleagues whose works he had visited, that he never knew a door to be shut through which he had expressed a desire to go.

Mr. William Edgar Allen, the donor of the new library at the Sheffield University, which was opened by His Royal Highness the Prince of Wales on Monday last week, is the Chairman of the well-known engineering firm of Messrs. Edgar Allen and Co., Limited, the Imperial Steel Works, Sheffield. Mr. Allen, who has provided the cost, amounting to £10,000, of the building which is to house the library, had previously shown his enthusiasm for the extension of higher education by other gifts to the same University. Donations by Mr. Allen of £5000 each to the Sheffield Royal Hospital and the Sheffield Royal Infirmary, as well as of £1100 to a guild having charge of the interests of the poor in Sheffield, were also announced on the same day.

USE OF TAR FOR ROADS.

There was a large attendance of representatives from all parts of the United Kingdom at the British Road Conference, convened by the County Councils Association, which was held in London from Thursday to Saturday of last week, under the presidency of Lord Belper. His Lordship opened the proceedings on Thursday morning with an address at the Institution of Civil Engineers; and subsequently sectional meetings were held simultaneously in that building, and at the Surveyors' Institution and the Institution of Mechanical Engineers, in the immediate vicinity. Altogether forty papers were submitted for consideration; and quite one-fourth of them contained references to the use of tar in connection with road making. We extract the portions dealing specially with this subject, which is one in which most of our readers are interested.

Mr. F. G. Carpenter, a Surveyor from the West Riding of Yorkshire, in a paper on "Road Maintenance," remarked that the principal cause of the increased expenditure which had taken place of late years on roads was the great alteration in the class of traffic, alike in regard to speed, weight, and method of propulsion, passing over them. He said the effect of the altered conditions of traffic had been to emphasize the defects of the ordinary class of macadamized roadways, and create a demand for a road which, in addition to being of sufficient strength, should be impervious to moisture, and therefore practically mudless and dustless. The present much-condemned method of binding together the aggregate of an ordinary macadam road by the use of road scrapings was productive of the greater part of the mud and dust found so objectionable; but for the rural roads the cost of providing a better-class binder was prohibitive. Tar had so far proved to be the best material for binding; and its use had led to the production of many patented forms of tar macadam. To substitute tar macadam on all roads would entail enormous expenditure; and it could, therefore, only be expected that the various highway authorities would undertake the treatment of the lengths of main roads that passed through the towns or villages. Experimental lengths of tarred granite, tarred limestone, and "Tarmac" had been laid down on some of the heavily trafficked roads in the West Riding; and so far the latter material was giving the best results. But whether its ultimate life would warrant an extension of its use, could not yet be determined. Its initial cost was high; but it had certainly much in its favour. The first cost per super. yard of the materials on the experimental lengths laid complete was as follows: "Tarmac," 4s. 5d.; tarred granite, 2s. 2d. to 4s. 6d.; tarred limestone, 1s. 8d. to 3s. 6d. The thickness of the coating of each of the materials was 4 inches consolidated, laid in two layers, the bottom being 3 inches thick of 2½-inch material, and the top layer of 1 to 1½ inch material. In comparison, the cost of ordinary granite macadam in this county varied from 1s. 3d. to 1s. 9d. per super. yard. During the past two years several lengths of main road in the urban or built-up districts had been tar-sprayed or tar-washed; and, with few exceptions, this treatment had given great satisfaction. Most of the work was done by machine, and cost ¾d. per super. yard, which, added to the cost of sweeping and sanding, brought the total to about 1¼d. This treatment undoubtedly prolonged the life of the metal by about 20 per cent.—thereby repaying the cost of the dressing, in addition to the saving in discomfort to the inhabitants in the immediate locality.

Mr. G. A. Phillips, the County Surveyor of Glamorgan, made the following remarks at the close of his paper on the "Construction and Maintenance of Roads," when dealing with the methods tried in coping with the dust nuisance: Tar-spraying has been carried out with much success. The first section done on a main road in Glamorganshire was carried out by hand with ordinary gas tar thoroughly boiled, at a cost of slightly under 1d. per super. yard for two-coat work, including sanding. Part of the length of road so treated was a hard stone surface, and part a limestone surface. While in both cases the abatement of dust was attained, the trial was more generally successful on the granite surface; this being probably due to the better wearing quality of the stone. Subsequently another section was tar-sprayed by machine; and, though this was carried out at less cost—viz., about ¾d. per yard for two-coat work—its effect was not quite so lasting as that done by hand. In both cases, however, the trials were successful; and there is no doubt that the preserving effect which it had on the roads treated has more than justified the expense, as the treatment added at least twelve months' life to the roadway. Tarring of footpath surfaces has also been found very effective; resulting in a great saving in the cost of maintenance, while affording much cleaner and much more pleasant surfaces to walk on. With the present experience, the author is of opinion that tar spraying or painting the surface of a road well constructed with hard stone on a strong foundation promises the best and most economical results, both in the matter of dust abatement and suitability for modern traffic. Waterproofing the roads in this manner enables the camber to be reduced to a minimum. Care should, however, be taken to properly construct the road with hard surface material on a sound foundation, and to tar the surface before it has been worn into holes or depressions, as it must not be expected that tarring of the surface will convert a bad road into a good one.

Mr. H. E. Stilgoe, the City Engineer and Surveyor of Birmingham, in a paper on the same matter, said: The subject of tarred macadam is now receiving considerable attention. Its utility greatly depends on the ingredients, their treatment and mixing. When it is said that this material will not stand heavy traffic, what is meant by it? It is not expected to wear like stone or wood paving. If the comparison is with ordinary macadam, then the process of bituminous binding will not stand heavy traffic either. When tarred macadam is used, the author is in favour of a bottom course of 4 inches of tarred 2-inch stone and a top layer of 1½ inches of fine, rather than finishing the surface with the larger stone. He believes that this system is better for repairing purposes. A tandem roller is best for this work. Taking into consideration the items of utility and cost and the facilities for construction and repair, the author is of opinion that, of macadamized roads, one constructed with good stone (water-bound) on a proper foundation, and the surface properly coated with hot coal tar, is much the best. The system of tar-spraying roads by machinery has greatly facilitated and reduced in cost what the author considers one of the greatest boons conferred upon the users of macadamized roads. It lessens wear and tear, prevents damage by suction of pneumatic tyres, reduces dust to a minimum, reduces mud, and generally increases the life of a road. Watering is unnecessary for maintenance on tarred surfaces; and when it is resorted to on ordinary macadam the spray should be fine. In repairing or patching ordinary macadamized roads, the surface of the defective place should be picked up, the old material removed, and fresh stone laid on and rolled in. A little fine tarred stone is useful as a binder in dry weather.

Colonel R. E. Crompton, in the course of a paper dealing with the reduction of the cost of maintaining roads by the improved construction of the roads themselves and of the vehicles passing over them, said he had taken great pains to note the effect of steel-studded tyres on roads which had been tar-bound to a sufficient depth. He had in mind certain portions of the Great North Road north of Hatfield, which two years ago showed grooves due to the action of the studded tyres, but which since they had been repaired and tar-sprayed to a sufficient depth to ensure the tar penetrating ¾-inch from the surface, at the same places showed no signs of grooving.

The creation and avoidance of dust were dealt with in papers by Mr. A. Dryland, the County Surveyor of Surrey, and Lord Montagu of Beaulieu, a member of the Council of the Roads Improvement Association. Mr. Dryland expressed the opinion with regard to tar macadam that, when the relative expenditure has been taken into consideration, it has not shown any considerable advantage over granite macadam roads, if the latter are surface tarred. It has this advantage, however, that yearly surface applications are not absolutely necessary, though the author considers that such treatment is desirable for maintenance purposes. Tar macadam has the disadvantage of not being easily repaired. It is true it can be patched, but not with such facility as ordinary macadam. In Mr. Dryland's view, it forms a satisfactory road for small towns and villages; but its first cost is prohibitive for general use on country roads under the present financial conditions, and it is not good enough for heavy traffic in large towns or on important roads adjacent to large centres of population. Lord Montagu closed his paper with the following remarks: "It may be safely said the best method by which the effect of dust-creating agents can be counteracted is to make the road waterproof; and the cheapest way to make it waterproof is to tar it. If, therefore, it is possible to lay tarred material at the start, that plan is the best of all; but if not, a coating of tar is the next best thing."

Mr. T. H. Yabbicom, the City Engineer of Bristol, also dealt with the chief causes of dust and how to avoid them. The work of the author in this special direction has already been brought under our readers' notice by the interesting report, given in the "JOURNAL" for the 23rd of February (p. 557), on his successful application of tar for the prevention of dust on the roads of the city. His paper was to a large extent a reproduction of the particulars contained in the report.

The Dessau Vertical Retort Patents.

Mr. Charles Hunt, representative in England of the Dessau Vertical Retort Company of Berlin, has recently received from them a letter informing him that the Reichsgericht, the highest Court of Justice at Leipzig, has given a decision favourable to the Company in the action between them and Herr Aug. Klönne, of Dortmund. The patents for the Dessau vertical retort are pronounced to be good; and the "value of the object" has been fixed by the Court at 1,000,000 marks (£50,000). It will be difficult to re-open this question, because, according to German law and the amount of the fixed "value," the cost of a new trial would be at least 100,000 marks (£5000). The Klönne Company have to pay all the costs in the action just decided, as well as those incurred in the preceding one, amounting to about 100,000 marks. The result of the trial is, it is claimed, a complete success for the Dessau Company, as all the claims put forward by the other side were rejected by the Court.

At the annual meeting of the Barking Urban District Council, Mr. W. B. Reidie, the Engineer and Secretary of the Barking Gas Company, was elected Chairman. The member who proposed him remarked that "he knew of no one more capable to fight the battles of the Council."

REGISTER OF PATENTS.

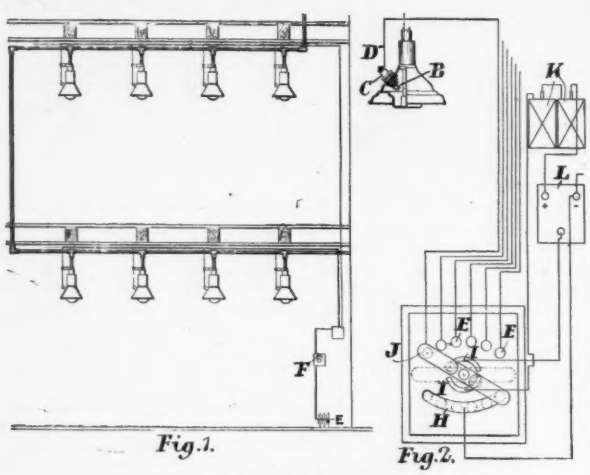
Gas-Lighting Appliances.

BROWN, T., of Manchester.

No. 6790; March 27, 1908.

This invention relates to the lighting of incandescent gas-lamps especially in mills, public buildings, and other places where they are inaccessible for lighting. It refers to an arrangement wherein the lamps are lighted electrically by wiring and sparking terminals arranged in the lamp; the wiring extending to a switch within reach of the person desiring to light the lamps simultaneously or successively.

The terminals (of nickel steel) are carried by a fire-resisting holder arranged near to the mantle or burner of the lamp. One of the terminals is connected by a wire to the gas-supply pipe which forms an "earth" return connection, and the other is connected by a wire to a battery and induction coil, and to the switch—the battery or switch being connected to a water-pipe or other "earth" connection. The switch is in the form of a plate with a number of contacts, each in circuit with one of the lamps; and a lever in circuit with the battery, on being swivelled over any one of the contacts, completes the circuit of the lighting terminals in a lamp, the current flowing through which serves to cause sparks to be emitted between the terminals and thereby light the lamp. When the lamp is lighted, the switch handle is moved on to another contact, when another lamp is lighted, and so on with each lamp.



Brown's Gas-Lighting Apparatus.

Fig. 1 illustrates an arrangement of mill lighting with the ignition devices applied thereto. Fig. 2 illustrates the switch, battery, and induction coil separately (to a larger scale). Fig. 3 illustrates a vertical section of one of the lamps, and shows the position of the sparking terminals.

In each of the lamps to be lighted is a set of sparking terminals B carried by a plug C which screws into the lamp casing—one terminal being carried by an inner insulated portion of the plug, and the other by the outer part of the plug. Connecting with the inner sparking terminal of each lamp is a wire D leading to one of the contacts E of the switch F. The other terminal, through the lamp casing and piping, connects to "earth." Forming part of the switch is a segmental contact H and two further segmental contacts I. Pivotally mounted to work over the several contacts is a switch-lever J, the axis or spindle of which extends through the switch cover; and outside the cover is a handle. In one with (or screwed to) such handle, or its spindle, is a small pointer; and upon the cover is a curved indicator plate, marked to indicate the position of the several contacts. In circuit with the contacts H and I are the batteries K and induction coil L. When in its normal position, the switch-lever J lies clear of the contacts E—being held in this position by a spring coiled around the switch spindle.

In proceeding to light the lamps, the switch-lever J is first moved on to the endmost contact E; and then on to each succeeding contact—the handle being held momentarily over each contact to ensure of the gas being ignited. When all the lamps are lighted, the switch handle is released; and, if no spring is used, it may remain where set. But if the spring is used it returns automatically to its original position.

Recovering Ammonia from Producer Gas.

LYMN, A. H., of Bromley, Kent.

No. 8014; April 10, 1908.

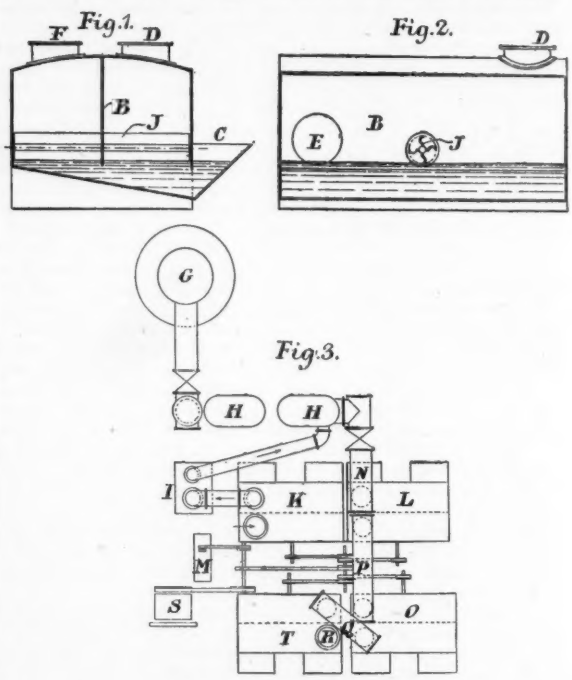
The plant for recovering ammonia from a gas-producer generally consists, the patentee says, of a mechanical washer and several towers; and the present invention provides "a simpler and less costly plant than that hitherto used, by the adoption of a washer of special construction." The washer forms a unit of plant which may be repeated as often as is necessary; and these successive units fulfil all the functions of the mechanical washer and towers hitherto used. Thus the same form of washer serves for washing the gas, for absorbing the ammonia, for saturating with steam the air supplied to the producer, and, if necessary, for cooling the gas.

The washer is an improvement on that described in patent No. 22,644 of 1900. It consists of a rectangular chamber having a longitudinal vertical partition which does not extend to the bottom of the chamber. The bottom is preferably inclined towards a water-lute, for removal of dirt; and the level of the water in the chamber is above the lower edge of the partition. At one end of the chamber (at the upper part) is an inlet for gas, opening into one of the compartments formed by the partition; and at the same end (also at the upper part) is an outlet for gas opening from the other compartment. In the partition at the end far from the inlet and outlet are openings for the passage of gas at or near the water level.

The chamber contains one or more blade-wheels or other like devices revolved to spray the water in, or entering, each compartment. The gas under treatment enters the inlet, passes along the corresponding chamber, through the partition, and along the other chamber to the outlet—having been brought in contact with the water thrown up by the dashers.

In a plant comprising this washer, any suitable type of producer may be used with or without a superheater. The gas from the superheater passes into the first of the washers, which acts as a gas-washer only. The water from this washer is circulated by a pump through it and a contiguously placed washer, which serves for saturating with steam the air supplied to the producer. Thus there is practically no loss of heat between the two washers, "such as is generally the case when using either two towers or a washer and a tower." If the air supply to such a plant were produced by means of a blower in the ordinary manner, the varying density of the fuel in the producer would, the patentee points out, render the mechanical spray of the air-saturator ineffective from time to time. He therefore provides a suitable blower between the air-saturator and the superheater, so that the air is sucked through the saturator, whereby the pressure therein remains practically that of the surrounding atmosphere and the water level remains constant.

The ammonia is absorbed in another washer, into which the gas passes from the first one; very dilute acid or other substance being used to fix the ammonia. A further washer may be employed as a gas cooling vessel, according to the use to which the gas is to be put.



Lymn's Ammonia Recovery Plant.

Fig. 1 is a transverse vertical section, and fig. 2 a longitudinal vertical section, through the washer according to the invention. Fig. 3 is a diagrammatic plan of the whole plant.

In figs. 1 and 2, the chamber is divided longitudinally into two compartments by the partition B, the lower edge of which is below the water level. The bottom of the chamber slopes towards the lute C. The gas enters at D, passes through the opening E, and leaves at F. A series of blades J, mounted on a revolving shaft, act as dashers to make the necessary spray in the chambers.

In fig. 3, G is the producer; and H are the superheaters through which the products pass in a direction opposite to that of the air. The latter is forwarded by a blower I, having been drawn through the washer K, which is constructed as shown in fig. 1, and contains water which has been heated in the similar washer L, through which and the washer K the water is circulated by a pump M. The washer L washes the gas entering it from the producer through the pipe N. The ammonia absorber is a vessel O (of the same type) connected with the outlet of the washer L by the pipe P. From the outlet of the ammonia absorber, a pipe Q conducts the gas into a fourth vessel T, which acts as a cooler, and the outlet R of which is connected with the gasholder. The engine S drives the dashers in the several washers, and works the pump M.

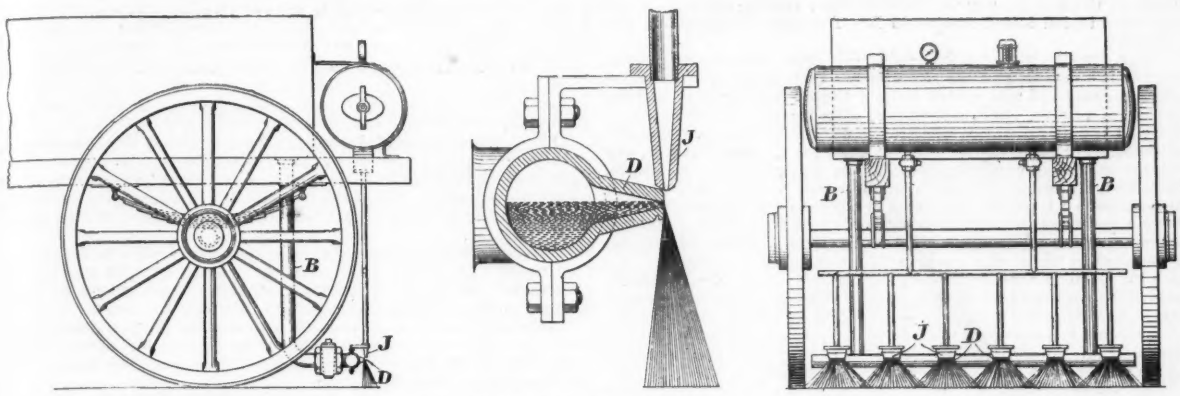
Spraying Tar upon Roads.

BLAKELEY, W., of Thornhill Lees, near Dewsbury.

No. 7367; April 3, 1908.

This invention of apparatus for distributing tar in a finely-divided state upon roads or the like, consists in modifications of the apparatus described in patent No. 4564 of 1907.

The conversion of the tar into spray and its distribution on the road surface are effected by causing the tar to issue from nozzles having their



Blakeley's Tar Road-Sprayer.

outlets contiguous to those of other nozzles from which compressed air is ejected. The tar-nozzles are preferably arranged in a horizontal position, and the compressed-air nozzles vertically above them. The outlets of the nozzles are contiguous, so that downwardly-directed streams of compressed air impinge upon the jets of tar, thereby converting them into fine spray and distributing them with "more or less violence" on to the road being treated.

The illustration shows in side elevation a portion of the vehicle for spraying tar, also an elevation of the back of the cart.

The tar is conveyed to the cross pipe C provided with horizontally disposed nozzles D. F indicates the compressed air storage vessel from which pipes communicate with the vertically disposed nozzles J. The air-pump may be worked intermittently or constantly by gearing (not shown) from the wheels of the vehicle.

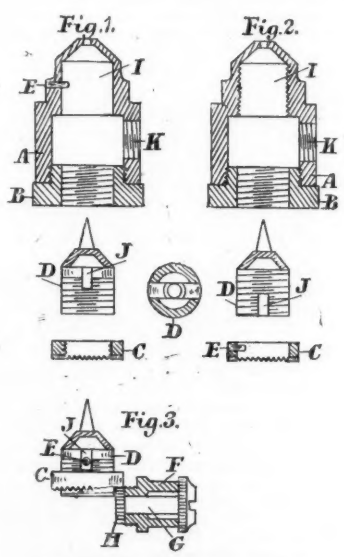
The mouths of the nozzles D are preferably in the form of slots, and grooves or lips are provided on the undersides to prevent tar trickling down their inferior slopes. The air-nozzles are by preference formed with oblong or slotted outlets similar to those of the tar-nozzles illustrated.

Adjustable Gas-Nipple.

ROTHERHAM, K., of Stoke, Coventry.

No. 9828; May 6, 1908.

This nipple, for gas-burners, can be adjusted accurately to give the proper supply of gas according to the pressure from the mains. It is the type of regulator in which the relative positions of a needle and the outlet hole of the nipple are adjusted by means of spur-wheel gearing.



Rotherham's Adjustable Gas-Nipple.

The nipple consists of the following parts: A body A; a connecting piece B; a needle plug D; a threaded wheel nut C, or a plain holed wheel C, with a driving-pin as shown at E.

In fig. 1, the chamber I is plain, bored to allow the adjusting needle D to fit easily. A guide-pin E fits into the chamber I; and the body of the needle at the needle end has a gap J, in which works the pin E. This is to prevent the needle rotating; but it allows it to move freely up and down. The wheel being screwed on the plug is fitted into the body A with the pin E in the slot J. The body is bored and threaded at K; and into the hole fits the spindle bearing F (fig. 3). On the inner end of the spindle G is fixed a toothed wheel H; and the teeth of this wheel engage in the teeth of the wheel C. When the wheel H is revolved by the spindle, the wheel C revolves on the needle plug; and as this cannot revolve with it, it is carried up and down in the body A, according to the way the spindle is revolved. Thus the needle point is made to regulate the flow of gas through the outlet hole in the body A.

In fig. 2, the chamber I is threaded, and the body of the needle plug is threaded its whole length to screw into the chamber. A carrier slot J is cut in the end of the plug at the end away from the needle. The wheel C is bored with a plain hole to fit on the needle plug body; and a driving-pin E is fitted in. The wheel C is connected to the wheel H, the same as in fig. 1. When the wheel H is revolved, it revolves the wheel C; and the driving-pin E revolves the plug D, which, being threaded in the chamber I, causes the needle point to close or open the outlet hole in the body A as desired. This form of needle plugs allows of a large hole through their centre for the flow of the gas, so as not to check the pressure before reaching the outlet of the nipple. The outlet from the plug is made by cutting two gaps in the body of the plug at the needle end, leaving the needle point on a bridge on the body of the plug.

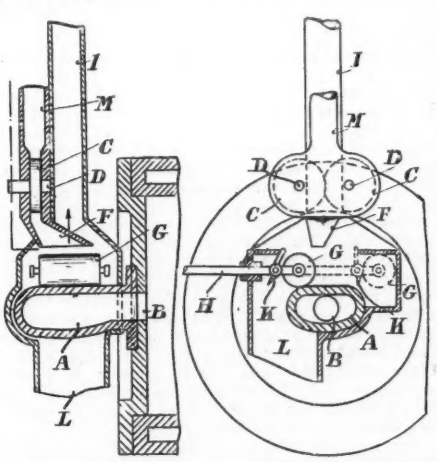
Generating Coal Gas for Operating Engines.

THIEMICH, B., of Dresden-Nausslitz, Germany.

No. 9891; May 6, 1908.

The process here referred to consists in causing pulverized coal to fall intermittently in measured quantities on to a heated surface, pressing it against the surface, and removing the residue, after the separation of the gas, before a fresh charge of coal is supplied.

The principle of the process lies in the fact that the heating of the pulverized coal and the separation of the gas take place on a heated surface in the absence of air, so that no combustion can take place; the coal being pressed against the heating surface to accelerate the process, and the feed being so regulated that before the supply of fresh coal (or at the time of the supply) the coke is removed from the heating surface, so that the area of the latter may be as small as possible. Owing to this method of regulating the supply, and to the rapidity with which the gas is generated, the gas can, it is said, be generated at the rate at which it is sucked into the engine by the piston, so that the engine can be stopped at any time without having a residual amount of gas unused —an advantage from the point of view of economy, and also lessening the danger of explosion.



Thiemich's Gas Generator for Driving Engines.

The apparatus shown is joined to the cover of the gas-engine cylinder. A is the chamber on the wall-surface of which the heating of the coal and the generation of the gas take place. The interior of the chamber communicates, by a port B, with the interior of the power-cylinder. The chamber A is heated by the products of combustion; while the engine may be started by means of benzene or other fuel.

When the chamber is sufficiently hot, the shafts D of two feed-rollers C are coupled to the engine, so that the rollers are rotated. Coal from the channel M is then intermittently fed in measured quantities by the rollers to the nozzle F, and falls on to the red-hot wall of the chamber. A roller G is then rolled over this wall from left to right by means of a rod H. The right-hand end position of the roller is indicated by a dotted circle. The roller spreads out the coal in a thin layer, and presses it against the hot wall, so that gas is immediately generated and passes upwards through a pipe I, and is then led to the cylinder. The pipe may also lead to a suitable collector and scrubber or other cleanser. During the return movement of the roller, a scraper K,

fixed to the rod H, scrapes the coke from the heating surface and causes it to fall into a receptacle L. The action described is then repeated.

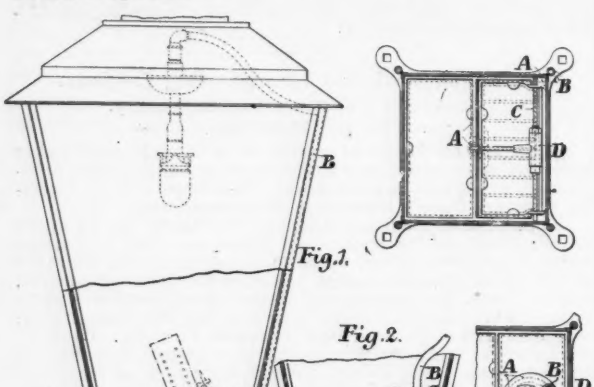
After describing a modification of this arrangement, the patentee says he is aware that in the manufacture of coal gas it is known to allow a charge of coal to fall on to a heated horizontal or inclined portion of a retort, where it is allowed to lie for about two hours until the coal is partly distilled, when it is then pushed into a vertical part of the retort to complete the process; and he is also aware that in gas-works a method of producing gas is known consisting in allowing coal to fall from a hopper through a hand-operated valve on to a movable charger, which is pushed, by means of a rod, so that it travels over the bottom surface of the retort and deposits a thin layer of coal thereon, which, after the gas has been evolved therefrom, is pushed forward and discharged by means of a movable plate attached to the charger. He lays no claim to these processes; but he does claim: A "process for generating coal gas for actuating internal combustion engines consisting in automatically feeding pulverized coal at regular intervals and in measured quantities on to a heated surface, automatically pressing it against this surface, and removing the residue, after the separation of the gas, before a fresh charge of coal is supplied.

Lighting Incandescent Street-Lamps.

CUTTELL, T. L., and the ANTI-VIBRATION INCANDESCENT LIGHTING COMPANY, LIMITED, of Otley.

No. 17,321; Aug. 18, 1908.

This invention refers to a lighting arrangement, wherein the pilot-jet is mounted upon, and carried by, the hinged door of the lamp, so as to be raised into the lighting position on the door being opened, and of being lowered into the inoperative position on the door being closed; the hinge of the door consisting of an auxiliary gas-supply pipe provided with an auxiliary cock fixed to the pilot-jet, and adapted to admit gas thereto on the door being opened and of cutting off the gas supply on the door being closed.



Anti-Vibration Company's Incandescent Street-Lantern.

Fig. 1 is a part sectional elevation and a sectional plan of an ordinary street gas-lamp, fitted with the arrangement; and fig. 2 is a modified construction.

A (fig. 1) is the main gas-supply pipe, which is conducted from the centre of the base of the lamp to one corner, where it is joined by a tube B forming one of the corner stays of the lamp and leading to the burner. To the pipe is attached an auxiliary gas-supply pipe C which is passed across and within the base of the lamp, and on which the lamp door is hinged. The auxiliary pipe is fitted with a swivelling auxiliary cock D provided with a pilot-jet mounted upon, and carried by, the hinged door, so that the action of opening the door has the effect of raising the pilot-jet into the lighting position and of simultaneously turning on the gas supply to it, while the action of closing the door has the effect of turning off the auxiliary gas supply and of simultaneously lowering the pilot-jet into the inoperative position. Stops are provided on the hinged door for limiting its opening movement, so as to ensure the lighting position of the pilot-jet; the latter being ignited by the torch E at the moment the hinged door is opened by the torch, as shown in dotted lines.

In fig. 2, F is a circular frame carried in the base of the lamp by a filling-in plate and being formed with the main gas-supply pipe A, which is conducted partially around the frame to an upstanding tube B situated within the lamp and leading up to the burner; and to the pipe is attached an auxiliary gas-supply pipe C, which is passed across the frame within the base of the lamp, and on which auxiliary pipe the lamp door is hinged.

Manufacturing Incandescent Mantles.

SEVERIN, L., of Hagen, Westphalia.

No. 23,122; Oct. 30, 1908.

The patentee describes a process for manufacturing incandescent mantles for inverted incandescent burners, characterized by the cut-off pieces of tubular material for forming the mantles being trimmed at the one end with a band, the free edge of which is drawn together in such a way, by means of a drawing thread drawn through it (or in the case of woven bands by means of the outermost warp threads), that a close dome-shaped end is formed, after which the mantle is finished in the usual manner.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Calorific Power of Tottenham Gas.

SIR,—With reference to the article by Mr. Arthur Edgcome Brown, on the comparative calorific value of Tottenham gas, and your comment thereon, the figures you desire shall be forthcoming in time for publication in next week's issue of the "JOURNAL." I would have forwarded them sooner, but I have been away a week, and only saw your article on my return.

The calorific value at the works has always been taken on the Junkers instrument, and is to this day. But, in our agreement with the Council, we undertook to provide them with Professor Boys' instrument; and they commenced to take the calorific values at the works.

After some time, by arrangement with the Council, it was decided to transfer the testing of the calorific value to the testing-station, and to take the test on the Junkers instrument, so as to correspond with the Company's own tests.

GODFREY WARBURTON, Chief Chemist.

The Laboratory, Tottenham Gas-Works, May 1, 1909.

Comparative Cost of Gas and Electricity.

SIR,—You are, of course, aware that correspondence has lately been going on in the "Daily Mail" on the subject of "Electricity *v.* Gas;" and I send you the following letter, which appeared in that paper last Thursday:—

ELECTRICITY *v.* GAS.

To the Editor of the "Daily Mail."

Sir,—I am somewhat interested in the above controversy alluded to by "Flatholder." The figures he gives to disprove "Householder's" letter are purely theoretical, and do not obtain in practice. We have had some considerable experience in West Ham with regard to the comparative cost of gas and electricity, and I beg to append a list giving actual figures taken from cases in this borough. No doubt some biased gas enthusiast will say that if these figures be correct the light obtained cannot be so good as would be the case if gas were the illuminant; but I shall be pleased to refer such a one to the householders themselves, who, in every case, will state emphatically to him, as they have to me, that the light is better than that they were obtaining from gas.

	Gas.			*Electricity.*		
(1)	June, 1907, to March, 1908	£2	7 6	June, 1908, to March, 1909	£1	0 3
(2)	June, 1907, to March, 1908	£4	5 0	June, 1908, to March, 1909	£1	14 6
(3)	June, 1907, to March, 1908	£11	14 6	June, 1908, to March, 1909	£2	15 6
(4)	Dec., 1907, to March, 1908	£4	3 6	Dec., 1908, to March, 1909	£1	8 0
(5)	June, 1907, to March, 908	£8	14 0	June, 1908, to March, 1909	£4	17 0
(6)	June, 1907, to March, 1908	£4	17 0	June, 1908, to March, 1909	£1	4 0

With reference to No. 3, the gas-meter in this case must have been wrong, since the saving effected by electricity is so great that it cannot be an absolutely fair comparison. The cost of electricity in this district is 3d. per unit, and the cost of gas 2s. 8d. per 1000.

In the above cases, metallic filament lamps were used; the pressure of the electric supply being 100 volts. Incandescent mantles were used in the gas supply. It can be stated with confidence that the above figures can be reproduced in any district where the rates of supply for gas and electricity are at all comparable with those stated. If the pressure, however, be 200 volts, a transformer will be necessary, the maximum cost of installation of which for a ten-roomed private house does not exceed £2.

I shall be pleased to give to any *bonâ-fide* inquirer the names and addresses of the consumers referred to in this letter by numbers only and to add to them almost *ad lib.*, since the cases given are taken quite hap-hazard, and are but a few of scores of instances which I could quote.

H. H. HOLMES, Sales Manager,
Yours faithfully,
West Ham Corporation Electric Supply.

84, Romford Road, E.

On the appearance of this letter, I wrote to Mr. Holmes, saying that I should be obliged if he would favour me with the names of the gas consumers from whom he obtained the figures he had quoted; and I enclosed with my letter a list for their names and addresses. Last Saturday morning I received the following reply from Mr. Holmes.

Dear Mr. Clark,—In reply to yours of the 29th ult., you will notice that I have made it a condition that the inquirer must be *bonâ fide*. I take it that you require the names and addresses for business purposes; and therefore you hardly come within the category of *bonâ fide*.

(Signed) H. H. HOLMES.

I ask you, Sir, and your readers, if you consider that Mr. Holmes is "playing the game."

HERBERT N. CLARK,
Assistant-Engineer, West Ham Gas Company.

Stratford, E., May 3, 1909.

Rating of a Tenant's Machines and Tools.

SIR,—Adverting to the paragraph under the above heading *in your* issue of the 13th of April, we should like to call attention to the misleading nature of the statements made in regard to what is therein described as "a striking instance of the failure of an attempt to rate an occupier's machines and machine tools." It is said that "in order that this point might not be obscured by any technical consideration, the appellants' Solicitor withdrew all technical matters; but nevertheless the respondents declined to proceed further with the case." Being much interested in the case of *Kirby v. Hunslet Union*, settled in the House of Lords on Dec. 18, 1905, we made some inquiries into the case, and have received the following reply from the Town Clerk of Southwark, with liberty to publish it.

Town Hall, Walworth Road, April 22, 1909.

Dear Sirs,

Edmund Evans, Limited, and Southwark Assessment Committee.

The Clerk to the Guardians has forwarded me, as Clerk to the Assessment Committee, your letter of the 19th inst.

The Committee are quite in sympathy with the principle laid down in

Kirby v. Hunslet Union, and have uniformly carried it out in assessing the properties in the borough. In the above case, however, additional machinery had been placed in the premises during the quinquennial period; and the appellants raised a somewhat different question to that settled in the decided case. It was agreed that each party, though not required by the rules, should set out their case, so as to limit the issue to the particular point raised. On receipt by the Assessment Committee of the appellants' case, they found a technical objection had been inserted, which on being brought before the Court would have been fatal to the chances of the Committee.

As the amount in dispute was small, and the quinquennial valuation will take place next year, the Committee thought it advisable to consent to the order asked for by the appellants rather than allow the purely technical objection to come before the Court.

(Signed) J. A. Johnson, Town Clerk,
Clerk to the Assessment Committee.

Comment upon the statement that the appellants withdrew all technical objections is superfluous.

THOS. F. HEDLEY AND SONS.

Sunderland, April 26, 1909.

Reformation of the Street-Lamp.

SIR,—I notice in your issue for April 20, among the "Editorial Notes," an interesting article on the above subject. In view of this, it may interest you to know that we have just produced five rough sheets dealing with a portion of the subject to which you refer—viz., the adaptation of existing lamp-columns for use with suspended inverted gas-lamps; and, what is perhaps more to the point, the prices of these are very reasonable, being subject to a discount of 50 per cent. We have made for some two or three years several rather elaborate ornamental harps; in fact, the pillar and harp shown in the enclosed booklet have been erected by the Engineer of the Cleethorpes Gas Company on the sea-front of that popular little seaside resort.

F. J. GOULD, London Manager,
Messrs. James Milne and Son, Limited.

59, *Farringdon Road, E.C., April* 24, 1909.

[The rough sheets referred to by our correspondent contain some excellent examples of head-work in the adaptation of lamp-columns to modern street lighting. The harp shown in the booklet mentioned, which contains specimens of inexpensive and artistic gas-fittings, is particularly good.—ED. J.G.L.]

The Liverpool Gas Poisoning Case.

As was stated in the "JOURNAL" last week, two Finnish emigrants on their way to America were found on April 21 dead in a Liverpool boarding-house; while two others (who subsequently died) were unconscious. The room was full of gas; the tap being turned on, though there was no light. The inquest was held last Friday, when the manager of the house said that, notices printed in seven languages, including Finnish, warning persons not to interfere with the gas-lights or gas-fittings, were posted close to the door of the room in which the men were found. Before his death, one of the victims stated that when he went to bed about 10.30 p.m. on the 20th, the other three men, who seemed to have had some drink, were sitting up playing cards. He fell asleep, and knew nothing more. A representative of the Gas Company testified to having examined the fittings and found them in good condition. Mr. Edward Allen, the Company's Engineer, said the gas supplied to the house was a mixture of coal gas and carburetted water gas, in which the latter was present to the extent of about 10 to 12 per cent. The proportion of carbon monoxide in this mixture was about 8 per cent., which was less than was found in ordinary coal gas in some parts of the country. The maximum varied in different parts of Liverpool; the proportion of carburetted water gas being highest in Garston, which was the district where the fewest accidents had occurred. Dr. Johnson said that, in the case of the two men who were found dead, their death was due to carbon monoxide poisoning, though whether it was caused by ordinary coal gas or to shorter exposure to a more dangerous mixture, he could not say. Dr. Lindsay stated that the men who were taken to the hospital presented the symptoms of ordinary coal gas poisoning. The Coroner, addressing the Jury, observed that the proportion of carburetted water gas in the mixture was not excessive. He considered, however, that a register should be kept of the various qualities of gas-mixture supplied, so that they could be ascertained if needed. A recommendation to this effect had been made by the Departmental Committee who inquired into the whole subject. In returning a verdict that the men succumbed to carbon monoxide poisoning, the Jury concurred with these remarks.

The Carron Company, of Falkirk, have sent a copy of their new season's gas booklet, which has been got up for distribution among gas companies. It contains illustrated particulars of the Company's cookers, grillers, hot-plates, boiling-burners, gas appliances, and boilers, neatly printed, and enclosed in a coloured wrapper, on the front page of which space is left for the insertion of the name of any company requiring copies for their show-room.

The following paragraph, taken from the "Ilkeston Advertiser" of the 24th ult., shows what municipal electricity supply is costing the ratepayers: "Tram receipts for the past week have been £118 13s. 1½d., against £123 9s. 4d. last year. The running of the trams and dealing in electricity for illumination and power are now costing the town somewhere about a 7d. rate, and that without allowing anything for depreciation, or making provision for emergencies such as would arise from a serious accident entailing the payment of heavy sums as compensation. It is hoped that no such *contretemps* will happen; for if it does the cost will have to be met out of the current rate. It is a risky policy; but the only alternative is to take out of the ratepayers' pockets a sufficient sum for contingencies that may never arise, and that is an alternative which is unpalatable as things are at present."

LEGAL INTELLIGENCE.

TRAMWAY LINES AND GAS-MAINS.

In the King's Bench Division of the High Court of Justice last Wednesday, Mr. Justice Phillimore had before him a special case stated by the Arbitrator (Mr. Allen C. Edwards) appointed under the Tramways Act, 1870, to settle a dispute which had arisen between the Bristol Gas Company and the Bristol Tramways Company, Limited, in regard to the construction of section 32. The section provides that the construction of a tramway shall not interfere with the rights of local and road authorities, or gas, water, or electric light companies, to deal with the roads for the purpose of repairing, laying down, or removing mains, pipes, &c., giving notice of their intention to do so, when the contemplated work will interfere with the traffic, or affect the tramway; and sub-section 5 provides that any extra expense in doing such work caused by the existence of the tramway shall be borne by the tramway company. In the present case, the Gas Company alleged that, by reason of the tramlines having been laid over the gas-mains, the Company had incurred additional expense in obtaining access to, and altering, their service-pipes; such additional expense for the period between Feb. 16, 1905, and Dec. 28, 1906, amounting to £115 8s. The Tramway Company having refused to pay this demand, the Gas Company applied to the Board of Trade, under section 33, to appoint an arbitrator. Mr. Edwards was thereupon selected; and he undertook the reference without prejudice to the contention of the Tramway Company that no such "difference" had arisen, as was contemplated by section 33. [This point was not now insisted upon.] Detailed particulars of the claim were furnished; and for the purpose of his award the Arbitrator had divided them into three classes: (1) Laying down a new service-pipe and connecting it, for the first time since the construction of the tramway, with a main laid before the construction, amounting altogether to £63 19s. 8d. (2) Repairing, altering, or removing a service-pipe laid since the construction of the tramway; the main having been laid before such construction, £14 1s. 8d. (3) Repairing, altering, or removing a service-pipe or main laid before the tramway was constructed, £37 16s. 8d. The Arbitrator held, with regard to the first class, that the Gas Company were not entitled to the extra expense of laying the new service, but to one-third of the amount claimed; being the agreed proportion of the total applicable to connecting with the old main, as distinguished from laying the new pipe. He therefore awarded them £21 6s. 6d. With regard to the second class, he held that the Gas Company were not entitled to the amount claimed. As to the third class, the Gas Company were entitled to the £37 16s. 8d.; and he directed the Tramway Company to pay the costs of the arbitration.

Sir Alfred Cripps, K.C., who appeared with Mr. Bethune and Mr. Weatherley for the Gas Company, submitted that they were entitled to the whole amount claimed; Mr. Simon, K.C., contended, on behalf of the Tramway Company, that nothing ought to have been awarded. Counsel on each side argued that the extra expenditure under the first class ought not to be divided, or any distinction drawn between laying and connecting. Mr. Simon further argued that the only work for which expenditure could be claimed was that which caused an interruption of the traffic, and that the Arbitrator was wrong in holding that the trifling delay shown to have taken place was such an "interruption" as was contemplated by the section, which he submitted was necessary for founding a claim for additional expense.

His Lordship, in giving judgment, said, as he thought, the Arbitrator was right all round; and he went on to minutely examine the words of the various sub-sections, which justified his decision.

The award was therefore confirmed, and the appeal dismissed, but without costs.

WATER COMPANY'S RIGHT TO SINK A WELL.

Supreme Court of Judicature—Court of Appeal.

(*Before Lords Justices* FLETCHER MOULTON *and* FARWELL.)

A few days ago, their Lordships had before them an appeal by the Attorney-General (on the relation of the Marquis of Salisbury) from a decision of Mr. Justice Hamilton, refusing to strike out two paragraphs of the statement of defence in a pending action by appellant against the Barnet District Gas and Water Company.

Mr. DANCKWERTS, K.C., and Mr. EUSTACE HILLS (instructed by Messrs. Nicholson, Patterson, and Freeland) appeared for the appellant; Sir ROBERT FINLAY, K.C., Mr. BALFOUR BROWNE, K.C., and Mr. J. D. CRAWFORD (instructed by Messrs. Bannister and Reynolds) represented the respondents.

Mr. DANCKWERTS said the action was one to restrain the defendants from doing something which the plaintiff alleged to be *ultra vires;* and it was exactly like the Frimley case.* A well was being sunk by the defendants at Shenley; and whether this was right or wrong was a matter to be determined at the trial. The two paragraphs which the Attorney-General desired to have struck out were of the most extraordinary character; and it was difficult to know exactly what the pleader intended to convey by them. As he (Counsel) understood the matter, it was an allegation that, because the Marquis of Salisbury had been represented by the Hertfordshire County Council when the Company's Bill was before Parliament, and because the County Council and the Rural District Councils of Hertfordshire and Hatfield had agreed that the defendants should be entitled to use the property concerned *ultra vires*, the action would not lie. How an agreement with the local authorities that the defendants should do something *ultra vires* could be a defence, he did not understand. But the second paragraph was still more extraordinary, because it said: "The relator and

* See "JOURNAL," Vol. CI., pp. 636, 843.

the inhabitants of the town of Hatfield and of the village of Essendon are estopped from contending that the defendants are not entitled to sink the said well for the purpose of obtaining a new water supply for the purpose of their general undertaking." This was as much as to say that the Attorney-General was estopped because, while the Bill was in Committee, Lord Robert Cecil and Sir Ralph Littler came to some agreement in respect of it. He could not really see what this paragraph had to do with the case. They moved to have the paragraphs in question struck out, on the ground that they were embarrassing, and disclosed no defence.

Lord Justice MOULTON remarked that it seemed very difficult to understand; and perhaps Sir Robert Finlay could explain it.

Sir ROBERT FINLAY said he thought, when he mentioned the facts, the Court would say that the paragraphs ought to remain. The action was brought to restrain the defendants from sinking a well on a piece of ground which they had rightly acquired, on the ground that section 10 of their Private Act did not entitle them to do it. His contention was, in the first place, that the clause did authorize what they were doing; but he went further, and submitted that the granting of an injunction on behalf of the Attorney-General was a matter for the discretion of the Court, and that the paragraphs which his friend was so anxious to get rid of showed circumstances which would lead the Court not to entertain for a moment an application for an injunction. When the Bill was in Committee, a compromise was arrived at on the matter of clauses; and it was stated in the clearest terms, as appeared by the shorthand notes, what was to be the real effect of the clauses. Clause 10 was as follows:

The Company may by agreement purchase, take on lease, or acquire and hold, for the purpose of the water undertaking (in addition to any lands authorized to be purchased by their previous Acts), any lands within the limits of supply not exceeding in the whole 15 acres, and may, on all or any of such lands, execute, for the purposes of or in connection with the water-works, any of the works, and exercise any of the powers, mentioned in, or conferred by, section 12 of the Water-Works Clauses Act, 1847; and the Company may also purchase by agreement any easement, right, or privilege (not being an easement, right, or privilege of water in which persons other than the granters have an interest) in, under, or over such additional lands which they may think requisite.

Lord Justice MOULTON: Supposing you are right, can you still justify bringing in as a defence something which does not create an estoppel against the Attorney-General?

Sir ROBERT FINLAY said for these purposes he must assume that, owing to some flaw in the drawing of the clause, they were wrong; but if it were so drawn, then he should submit it was a case in which most certainly an injunction would not be granted on the relation of one of the parties to the agreement. He thought it would be found that, where proceedings were taken at the instance of a relator, the Attorney-General was not entitled to an injunction as of right. But the Court would consider all the circumstances; and if it appeared that the Attorney-General's name was being used by a relator who had entered into an agreement in the very teeth of which the proceedings were being taken, no injunction would be granted.

After some further discussion, in the course of which Sir Robert Finlay read extracts from the proceedings before the Committee, which showed the view that Lord Robert Cecil, who appeared for the relator and the County Councils, took of clause 10,

Lord Justice MOULTON said anything which took place before the Committee did not make a contract to which the public were a party, nor did it make an estoppel. Nothing they did that day would prevent the defendants being perfectly free to bring the matter before the Court, either as to the mode of relief, or the apportionment of the costs. But he thought that the paragraphs in question should go out of the pleadings, and all the costs in the proceedings be costs in the cause.

Sir ROBERT FINLAY said he should like to have it made perfectly clear that no objection should be taken at the trial to the defendants raising these matters, on the ground that they did not appear in the pleadings.

Lord Justice MOULTON: Certainly. In setting aside the order, and striking out the paragraphs, it is on the clear understanding that no objection must be taken to bringing them forward, on the ground that they did not appear in the pleadings.

Mr. DANCKWERTS said the Attorney-General would not object.

Heavy Sentence for Gas-Meter Robbery and Violence.

In the "JOURNAL" for the 13th ult. (p. 104), we reported the hearing at the Thames Police Court of a charge against William Musson, a young man of 20, of stealing 6s. 5d. from two prepayment gas-meters belonging to the Commercial Gas Company, assaulting Susan Sarah Rogers, a girl 13 years of age, and attempting to murder his aunt, Alice Robshaw—the last-named sustaining considerable injuries. Accused was committed for trial on the three charges, and was brought up at the Central Criminal Court on Monday last week. Evidence having been given by Mrs. Robshaw, who was still in a very weak condition, the prisoner was found guilty in each case; and the Common Serjeant (Sir Albert Bosanquet, K.C.) sentenced him to five years' penal servitude.

Tin Discs in Slot-Meters.

At the Skipton Police Court, a few days ago, Madeline Guy, a married woman, was summoned at the instance of the Skipton Urban District Council for removing part of a gas-meter, and also for taking gas. John William Ashton, a collector in the service of the Council, said that he visited the defendant's residence for the purpose of collecting money from the penny-in-the-slot gas-meter. He proceeded to the cellar, and detected a strong smell of gas. The works of the meter were exposed. Upon being asked who opened the meter, defendant replied, "I opened it; I had a penny fast." The cash-box was then taken out and carried upstairs by witness, when he found inside a number of tin discs. He asked defendant who had put them in, and she blamed the children. The meter was emptied, and witness left the house saying he would go next day and put it in order. He did so, and then he found in the cash-box another false coin. On asking defendant why she put it in, she admitted doing it because she had not a penny. Defendant expressed sorrow, and pleaded ignorance of knowing she was doing anything wrong. The Chairman (Sir Matthew A. Wilson, Bart.) remarked that the breaking of the meter was the worst offence. The Clerk to the Council (Mr. R. Wilson) said they simply wanted to give a warning to other people. They did not wish to injure the defendant. The Chairman said the Bench were not inclined to be severe. No doubt the penalty—the maximum was £5—which was inflicted upon the defendant would be a deterrent to other people. She would be fined 5s. and costs in each case.

Alleged "Improper" Use of Gas.

At the Old Street Police Court a few days ago, before Mr. Cluer, Robert Gilham, of Bookham Street, Kingsland, was summoned by the Gaslight and Coke Company for "unlawfully and improperly" using a quantity of gas, of the value of £1 2s. 8d., their property. Mr. Humphreys, Solicitor, appeared for the Company, and said the proceedings were taken under the Gas-Works Clauses Act, 1847. Defendant was the occupier of two rooms in a house in the above-named street, and in one was fixed a prepayment gas-meter. On the 24th of November last, one of the Company's collectors called at the rooms, but failed to get admission. He called again on the 13th of February, and found that the money-box in the meter had been broken open, so that a penny could be dropped in and taken out again as occasion required. In this way, said Mr. Humphreys, the defendant had been able to obtain a large quantity of gas; and he contended that this was an "improper" use of it under the Act. His Worship remarked that the defendant might have used it, but not "improperly," for lighting, cooking, and even warming himself. Mr. Humphreys said the quantity consumed was 5984 cubic feet, which was more than the defendant would have used in the ordinary way. In his defence, Gilham said he had been in possession of the rooms for about two months only when the collector called in February; and he then explained that he found the box broken. All he had done was to take the money out, so that the children should not steal it. He admitted, however, that when the collector asked for the amount due he was unable to give it to him. Mr. Cluer said he failed to see that there had been any "improper" use of gas. The meter was out of order, and the defendant should have written to the Company. Supposing he had put in the proper number of pennies one after another and they had been stolen, the Company would have claimed the money from him. The summons must be dismissed. Addressing the defendant, he said he must pay the money the Company claimed.

Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards resumed their sales of gas and water stocks and shares. The sale consisted entirely of new issues by order of Directors. The first lots offered were 400 "B" £10 shares and some 4 per cent. perpetual debenture stock of the Grays and Tilbury Gas Company. The shares rank for a standard dividend of 7 per cent., subject to the sliding-scale, equally with the existing "B" capital, the dividends on which have for the last five years been paid at the rate of £5 12s. per cent. per annum. They were all sold at from £10 7s. 6d. to £10 12s. 6d. per share, *cum div.* as from the 14th inst. The debenture stock was sold at par. The next lots consisted of £4000 of 4½ per cent. perpetual debenture stock and 200 new ordinary £10 shares (7 per cent.) in the Ascot District Gas and Electricity Company. The £100 lots of debenture stock fetched from par to £101 10s.; and the shares were sold at from £10 to £10 5s. each. The other new issue was 500 new ordinary £10 shares (5 per cent. maximum dividend) in the Southend Water Company, carrying a dividend of 4¼ per cent.; and they fetched from £10 to £10 7s. 6d. apiece. At the Sun Hotel, Chatham, a few days ago, Messrs. Kidwell and Son sold 500 ordinary £5 shares in the Brompton, Chatham, Rochester, &c., Water Company at from £9 2s. 6d. to £9 4s. 6d. each. At the Bull Hotel, Horncastle, Messrs. Parish and Stafford Walter sold two £10 shares in the Horncastle Water Company for £8 2s. 6d. each. Messrs. Buckland and Sons sold last Thursday two original £20 shares in the Windsor Gas Company for £43 10s. apiece, and nine new shares of similar nominal value, but only £8 paid, at £11 17s. 6d. each.

Street Explosions in Oldham.—Referring, at a meeting of the Oldham Electricity Committee, to a recent street explosion, Mr. Hardman expressed the opinion that something ought to be done to try and prevent such occurrences. Mr. Dixon said he thought they had done away with the possibility of explosions; but lately they seemed to have had them almost fortnightly. He wanted to know if the cables were examined. An assistant from the electricity station stated that the cables were examined nightly. Mr. Dixon said that these explosions were dangerous to life and limb, as well as to property; and the public were almost afraid to walk on the footpath. After further discussion, a resolution was passed to the effect that the Committee be informed of the number, dates, and causes of explosions during the past twelve months.

Gas Profits at Chorley.—The Chorley Town Council have adopted the balance-sheet of the gas-works, showing a total profit of close on £2000. It was decided to appropriate £1343 of the surplus to the relief of the rates, and to place the balance, together with £623 paid out of revenue, to the liquidation of a sum of £6469 which the Corporation have undertaken to the Local Government Board to pay off in five years. It was further resolved that a yearly contribution of £1219 be charged in future on the gas account until the amount is cleared off. Mr. Sandham moved that the matter be referred back, as a protest against the proposal to devote gas profits to the relief of the rates; contending that it was a wrong use to make of the money. Alderman Lawrence took exception to the word "wrong," but Mr. Sandham said he should have liked to use a stronger phrase. There was no seconder to the amendment,

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Conway Gas Bill, Littlehampton Gas Bill.

Bill read the third time and passed: Wells Gas Bill.

Bill withdrawn: Lisburn Gas Bill.

The Alliance and Dublin Consumers' Gas Bill and the Stourbridge and District Water Board Bill have been referred to a Select Committee, consisting of Lord Ludlow (Chairman), the Earl of Hardwicke, the Earl of Liverpool, Viscount de Vesci, and Lord Saye and Sele; to meet to-day.

The York Corporation and the York Water-Works Company have petitioned against the Northallerton Water Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords' Bills read the first time and referred to the Examiners: Bungay Water Bill, Donington Water Bill, Frimley and Farnborough District Water Bill, Grantham Water Bill, Wells Gas Bill.

Lords' Bill read a second time and committed: South Lincolnshire Water Bill.

Bills reported, with amendments: Aldershot Gas and Water Bill, Heckmondwike and Liversedge Gas Bill [Lords], York Town and Blackwater Gas (Electric Lighting, &c.) Bill.

A Bill to confirm Provisional Orders made by the Board of Trade relating to Prestatyn Gas and Fermoy Gas has been presented, read the first time, and referred to the Examiners.

On Tuesday, the consideration of the Gaslight and Coke Company Bill as amended was further deferred till to-day.

Mr. B. S. Straus (Mile End) has given notice that he will to-day ask the Secretary of State for the Home Department whether his attention has been called to the remark made by the Southwark Coroner at a recent inquest on a child whose clothes had been set on fire by a gas-grill, that such a case was not contemplated by the framers of the Children Act; and whether he will consider the propriety of amending the Law in order to secure that all fires are properly guarded. [The inquest referred to is reported in another column.]

SALFORD GAS BILL.

House of Lords Committee—Wednesday, April 28.

(*Before Lord* DONOUGHMORE, *Chairman*, *Lord* MONK BRETTON, *Viscount* HILL, *Earl* MORLEY, *and Lord* HINDLIP.)

This was a Bill promoted by the Salford Corporation, to authorize, among other things, the extension of their gas-works, and a reduction in the illuminating power of the gas supplied.

Mr. BALFOUR BROWNE, K.C., the Hon. J. D. FITZGERALD, K.C., and Mr. ROE RYCROFT appeared for the promoters. The petitioners against the Bill included the Manchester Corporation, represented by Mr. HONORATUS LLOYD, K.C., Mr. R. S. CLEASE, and Mr. G. RHODES; the Lancashire County Council, by Mr. FORBES LANKESTER, K.C.; the Eccles Corporation, by Mr. RAM, K.C., and Mr. E. TYLDESLEY JONES; the Salford Board of Guardians, by Mr. MACMORRAN, K.C., and Mr. H. DAVEY; the Swinton and Pendlebury Urban District Council, by Mr. HONORATUS LLOYD, K.C., and Mr. VESEY KNOX, K.C.; the Barton Rural District Council, by Mr. R. S. CLEASE; and the Worsley Urban District Council, by Mr. C. C. HUTCHINSON.

Mr. BALFOUR BROWNE, in opening the case for the promoters, said the Corporation were seeking powers to acquire certain lands, owned by Lord Ellesmere and adjoining the present works, for the extension of their premises, and to reduce the statutory minimum illuminating power of the gas supplied from 17 candles to 14 candles. They also sought authority to raise additional capital to the extent of £250,000. Opposition to these proposals was offered by various local bodies whose districts were supplied with gas by the Salford Corporation. Under their Act of 1862, the promoters were bound to supply gas to these districts of an illuminating power of 18 candles; but by an agreement arrived at in 1897, this had been reduced to 17 candles. Since the invention of incandescent mantles, the same luminosity was now given from low-power gas as was obtainable from high-power gas. He did not think that these outside districts had any real objection to the powers asked for being granted. What they were trying to do was to obtain a share of the profits of the Salford gas undertaking. They demanded practically either that they should have a share of the profits or that the profits should be devoted to reducing the price of the gas. The opposition, he believed, rested on an entire misapprehension of the position a corporation occupied. It had been decided that, in regard to the supply of an outside area, a corporation were in exactly the same position as a company. They could not tax an outside community if there was a loss—the loss would fall entirely on their own ratepayers. In 1891, these same districts petitioned against an Order for which Salford was asking Parliament. Their demands then were the same as they were now. As a result of their opposition, an agreement was arrived at under which Salford undertook that if any of these districts within two years promoted a Bill to supply gas to their own ratepayers, and take over the Salford Corporation's responsibility in regard to them, it would not be opposed. In pursuance of this agreement, the Swinton and Pendlebury Local Board lodged a Bill; but the House of Commons would not give them power to supply any area except their own. Salford then contended that the obligation on their part was to sell the whole or none; and the Bill was rejected. In 1895, when Salford were seeking to obtain an Order sanctioning the borrowing of more money, the same objections were raised by these outside districts. At that time a General Election was pending, and the matter was not gone fully into. The House of Commons, however, decided that there must be a limitation of profits, and, in consequence, the Bill was withdrawn. In 1897, the Corporation promoted another Bill; and the same opposition being forthcoming, an agreement was arrived at under which these out-districts were to be supplied with gas at the same price as was charged to Salford. They were to erect testing-stations at their own expense and to share the cost of equipment with Salford, and were to have gas of 17-candle power. In consequence of this agreement, the demand for a share of the profits was withdrawn, and it was a downright breach of the agreement then entered into to revive this demand. In regard to the claim made by Barton for a share of the profits, he pointed out that it cost Salford more to supply Barton than was received in return.

At this point the Committee adjourned.

Thursday, April 29.

On the resumption of the proceedings this morning,

Mr. BALFOUR BROWNE, continuing his opening address, asked their Lordships, as a matter of good faith, to keep the outside districts to the bargain they made in 1897. Salford was quite prepared to abide by the conditions of the agreement, except in one particular. They proposed a departure which would be quite as much to the interest of the outside districts as it was to Salford. They proposed to reduce the power of the gas supplied from 17 candles to 14 candles. Any economy which would result from this change would benefit the outside districts quite as much as it would the borough itself. The outside areas, though they were entitled to some protection, were only entitled by law to be treated as though they were dealing with a company. Salford charged a lower price for gas than almost any town. The charge was lower than in Manchester, Bolton, or Warrington; while these towns charged a great deal more to outside districts which they supplied than to their own ratepayers. It was because Salford was supplying at a very low rate that such large quantities of gas were used. If the Corporation had been making 10 or 15 per cent. profit, the outside districts might have had reason to ask for a limitation or a share in the profits. But from 1899 to 1907, the profit made by the Corporation had been very small. During these years, the average profit paid in dividend by the three great London Gas Companies had been 7·9 per cent.; while in Salford—including, of course, the sinking fund—the profit had been 6·73 per cent. There were 75 per cent. of the consumers in Salford itself. The Corporation had taken the risk of this undertaking which happened to have paid latterly. While it was making a loss, the outside districts made no claim to be allowed to bear a share of it. Salford took the risk, and was entitled to the profit. Dealing with the case of Worsley, who in 1897 agreed to a differential rate of 2d. and now asked to be supplied at the same price as Salford, he contended that there was no reason for going back on the bargain. In reference to the demand for testing-stations, he pointed out that Salford had already supplied them to Swinton and Pendlebury, and that the gas could be tested there. He denied that there would be any loss to the consumers by the lowering of the candle power. It was true that it would be cheaper to produce gas of lower candle power; but the outside districts would get the benefit of the economy in the reduction in the price of gas. No gas engineer would come forward and say it was wrong to reduce the candle power, in view of the fact that a reduction such as was now proposed was taking place all over the country. If this case were being tried for the first time, he should urge that the outside districts were entitled to be treated by the Corporation just as they would be by a company; but it was not being tried for the first time. It had been tried on three separate occasions; and the last time a solemn bargain was come to. He asked their Lordships to say that, in the interests of good faith, they would not allow the bargain to be broken. The circumstances were precisely the same now as they were then—the Corporation were supplying gas at a very reasonable price, and were deriving a very small profit.

The CHAIRMAN said it seemed to him the first point that arose was whether the bargain arrived at in 1897 was to be broken or not. It would be convenient if they confined their attention to that—whether the reduction from 17 to 14 candle power was a breach of the spirit of the bargain arrived at in 1897.

Mr. VESEY KNOX said he altogether objected to his learned friend's statement that there was a bargain come to in 1897 which could never be altered. What happened in 1897 was this—the Salford Corporation came for some further capital, and terms were made which were binding on both parties while that capital lasted. When the Corporation came and asked for additional powers, his clients were entitled to ask for further concessions. He could not accept the statement that the bargain of 1897 was binding for all time, and could never be altered. He did not suggest that it was any breach of faith on the part of the Corporation for them to ask to be allowed to reduce the candle power, if they could prove that circumstances had changed and that the legislation of the past should be altered.

Mr. *W. W. Woodford*, the Gas Engineer to the Salford Corporation, was the first witness. He produced statistics showing the consumption of gas for the past ten years, and stated that in the years 1911-12 all the available plant at the disposal of the Corporation would be in use. They were therefore seeking powers to acquire other land adjoining the present works. He considered the site the most suitable that could be obtained in the borough. He had prepared a statement of the probable cost of the proposed extension. The land, including incidental charges, he put down at £60,000, and the total cost (including the land) at £250,000, which was the amount the Corporation asked to be allowed to borrow. He considered this expenditure necessary in order that the Corporation might carry out their obligation to supply gas. He did not think the four Local Authorities petitioning against the Bill would be injuriously affected by the proposed reduction of the candle power. A great bulk of the consumers used modern burners, which gave better

results with a low candle power. Worsley objected to the differential charge of 2d. This was a sparsely-populated district, and he thought the differential rate of 2d. was justified by the circumstances. The district was extensively undermined, and consequently there was a large loss from leakage. There was no truth in the suggestion that there had been great waste in dealing with the capital. With regard to Barton, the amount of gas they took was about ½ per cent. of the whole production. The population was less than 1 per acre, and the supply resulted in a loss rather than a profit. The consumption of gas in the district had decreased by 14 per cent.

Mr. VESEY KNOX: You are paying off your capital out of the profits you make partly from Salford and partly from outside?

Witness: We say it has nothing to do with the outside consumer what we do with our profits.

You have paid back a considerable part of the capital spent on the undertaking, partly out of the profits made within the borough, and partly out of profits made outside?—It has nothing to do with the outside district.

You have stated your capital as £935,000. I put it to you that the actual capital outstanding is only £562,000. I take that from the accounts of the Corporation of Salford?—Yes.

On the capital sum now outstanding your profits would be a great deal larger, would they not?—Yes, substantially larger.

I see the table is only completed to the end of March, 1907? Is one reason for this that if you had taken it to March last the gross profits, instead of being £69,000, would have been £85,000?—That was not the reason for stopping at 1907. The figures were taken from "Field's Analysis," in order that we might compare them with the London Gas Companies.

Last year you made a gross profit of £85,902. This amounts to 13d. per 1000 cubic feet of gas sold. So that the profit on the gas you sold at 2s. 3d. was 1s. 2d. per 1000 feet?—The gross profit taken out of the undertaking would, on the amount of gas sold, represent about 9·19d.

The sum you take by way of relief to rates is equal to about 8½d. in the pound on the rates of the borough?—I am not concerned with the borough rates.

Is the sum you are taking in relief of rates 4·53d. on every 1000 feet of gas?—Yes.

The total quantity of gas sold outside the borough is 418 million feet a year—that is, 56 per cent. of the total sale?—That is so.

And out of this you take 4½d. per 1000 feet for the relief of the rates of Salford?—No; the profit that goes to the district fund is 3·83d.

In 1897, the price was 2s. 2d. in Salford, and 2s. 4d. in Eccles and Swinton. Now after all these years the price is 2s. 3d. all round?—That applies to ordinary consumers.

So that you are actually receiving an average price more than you received in 1897. In the Bill you are seeking to reduce the candle power from 17 to 14 candles, and substitute a new burner; so that a lower quality of gas will produce a higher result. The net effect is that you gain something like 5-candle power?—Nothing of the sort. It all depends upon the quality of the gas.

Would it not require 30 per cent. more gas to get the same light that you are getting now with an ordinary flat-flame burner?—The flat-flame burner is a thing of the past.

Can you show me anything in the Bill which compels you to give the consumer the benefit of the saving in the cost of production and not give it all to the ratepayers of Salford?—We intend to give the whole saving effected by the lower power to the consumers in and outside the borough.

Is there anything in the Bill to compel you to do so?—There is nothing in the Bill. Our contention is that as 75 per cent. of the gas is consumed in the borough, and the gas undertaking is controlled by elected representatives of that 75 per cent., there is every safeguard that the people will not sit down under a high price of gas in order that we may make more money than we are entitled to.

But the ratepayer in Salford gets the advantage when the outside consumer has to pay a high price. Let us compare your charges with those of large companies in other towns?—We compare favourably with companies in our immediate vicinity.

Take Newcastle-on-Tyne, they charge 20·71d. as against your 27d.—They are actually on top of the coalfields.

Take Plymouth, there the price is 20·79d. Take the average of all the large provincial towns for 1907, as given in "Field's Analysis," and you will find it is 22·77d. as against your 27d.?—It is no use comparing prices unless you know the quality of the article supplied and all the surrounding circumstances. You must go into the character of the district, the length of mains, the population, and everything.

But I am taking the average of the whole?—You must take special circumstances into consideration. We have a very sparsely populated district, and we say it is a reasonable and cheap price, and we are serving the district very well indeed.

Mr. HUTCHINSON: You justified the differential charge of 2d. in Worsley by the large amount of leakage?

Witness: I did not say that. I said it was a sparsely-populated district compared with Salford, and that the expenditure was consequently greater per 1000 cubic feet.

The whole of your district is undermined?—The undermining in Barton and Salford is comparatively small.

You wish to lower the illuminating power of the gas; and for the purpose of testing you are proposing to use a new burner which gives better results?—We are proposing to use the No. 2 "Metropolitan" burner.

Mr. TYLDESLEY JONES: Are you prepared to insert in the Bill a clause to the effect that, if and when the candle power is reduced, you will supply and fix free of charge a sufficient number of burners suitable for the consumption of the gas in substitution for the burners in use at the date when you make the change?

Witness: It is not for me to say; but I have no doubt my Corporation would be quite willing to supply them if people asked for them.

Mr. FITZGERALD: Within a reasonable time?

Mr. TYLDESLEY JONES: Two years?

Witness: Yes.

What is the charge for public lighting in Salford?—It is according to the quantity used. We do not make any difference whether it is for public lighting, heating, power, or private lighting. The actual price is about 1s. 11d.

In re-examination by Mr. FITZGERALD, witness said Salford compared favourably with the surrounding towns. At Liverpool, the price was 2s. 6d. per 1000 cubic feet for 20-candle gas.

Professor *Vivian B. Lewes*, examined by Mr. FITZGERALD, said he was aware of the proposals in the Bill as to the quality and testing of the gas supplied by the Salford Corporation. As to the quality, he said that, inasmuch as London had been more thoroughly legislated for on the question of gas than any other town, it was desirable to bring all the large provincial towns in line with London. As regarded the testing, it was proposed to adopt the burner sanctioned by Parliament as the one most suitable for the development of the illuminating powers of gas—viz., the No. 2 "Metropolitan." Previous to 1905, gas was always tested by the No. 1 "London" argand burner, originally constructed for the burning of 16-candle gas. The No. 2 "Metropolitan" argand burner had been adopted by the London Gas Companies, and was prescribed in Gas Acts as the burner for the purpose of testing.

Friday, April 30.

On the resumption of the proceedings to-day,

Professor *Lewes* was re-called and cross-examined.

Mr. HUTCHINSON: I understood you to say yesterday that the large provincial towns ought to be brought down to the London standard?

Witness: I do not know that I said "brought down."

Cannel is not used in London gas. It is regarded as too expensive a luxury, is it not?—I do not think that is altogether the objection. Enrichment by cannel is less objectionable than any other form of enrichment; but what is wanted is gas made directly from the coal most available in the neighbourhood.

In fact, you would regard the use of cannel as an improvident and unprofitable way of working?—That depends entirely on the price. If you have to pay a high price for cannel, then it is expensive; but it may be the same price as ordinary coal.

In reply to further questions, witness admitted that if they abolished the use of an expensive and unnecessary commodity for the production of gas, they would be able to produce it cheaper and supply the consumer at a lower price. He agreed that a larger volume of gas of low standard would be produced from a ton of coal than if they were producing gas of high illuminating power. He knew that the price fixed by Parliament in connection with its concessions to the gas companies was based upon the quantity of gas which could be produced from a ton of coal. If Parliament had given a company permission to charge 5s. as a maximum price for 17-candle gas, he should say that it would be quite justified in reducing the illuminating power if it reduced the maximum price.

Mr. HUTCHINSON: Gas consumed by the burner at present used in Salford for testing would give a different result if it had been burnt in a No. 2 "Metropolitan"?

Witness: Yes; but it entirely depends upon the quality of the gas. The striking difference between the burners is the means whereby the quantity of air that oxidizes the gas is regulated and adjusted. In the Salford burner, there are no means of regulating the air. The burner was constructed in order to consume gas of 18 or 19 candle power; and you have just sufficient air for that quality. In the No. 2 "Metropolitan," you have an inlet for the air which you can regulate exactly to suit the quality of the gas. This burner would give very nearly the same results, at all events within a quarter-of-a-candle, if, instead of taking 16-candle gas, you had 14-candle gas or even less. This is now the standard test-burner. The Salford burner, like the old "London" argand, was made for one quality of gas.

I put it to you that if I have a gas of 17-candle power, and then it is reduced to 14-candle power, I should have to use a larger quantity to get the same quantity of light?—In an inferior burner you would.

The same thing holds good of calorific power, a cubic foot of gas of 17-candle power will give a greater quantity of heat than a foot of gas of 14-candle power under identical conditions?—I do not think so.

Take the case of a gas-engine. Is it not a fact that the richer the gas the higher the percentage efficiency?—No, I do not think so.

Mr. FITZGERALD: For gas-engine purposes, 14-candle gas is practically as good as 17-candle?

Witness: If the Salford Corporation were to reduce their standard from 17 to 14 slowly and gradually, there is hardly a consumer who would know that there had been any change, whether the gas was used for lighting, power, or calorific purposes. You get very little advantage from a high-power gas unless you can regulate the air supply. Very often with a lower quality of gas and an incandescent mantle you get better results than with an 18-candle gas.

Replying to further questions, witness admitted that if the illuminating power of gas was reduced from 18 to 14 candles, the cost to manufacture would be lower. He thought the consumer should have the benefit of the reduction. In his opinion, the incandescent burner was now practically universal.

Mr. *S. Y. Shoubridge*, the Engineer to the South Suburban Gas Company, and for many years Gas Engineer to the Salford Corporation, said it was quite necessary that the works should be extended. The present site was full up, and there was no room for development. The proposed additional site was a good one. In reducing the illuminating power and in adopting the proposed method of testing, the Corporation were bringing themselves into line with the other large undertakings of the country. The standard of illuminating power in Salford was too high. The introduction of the incandescent mantle had revolutionized the question of the luminosity of gas. Tests had been made at Salford with 19-candle and 14-candle gas with the incandescent burner, and the results were practically identical. He had tested with even a lower quality of gas, and had got better results than from gas of higher power. It was mere waste to manufacture high-power gas. The South Suburban Gas Company were now supplying 14½-candle power gas.

Mr. HUTCHINSON: Was I mistaken if I thought you said that 18-candle gas burnt with an incandescent mantle would give no better

result than, or practically the same result as, 14-candle gas burnt with the same mantle and the same burner?

Witness: Quite so, and even lower than that.

From a company point of view, the sliding-scale admits the consumer into partnership?—To the extent that the consumer and producer both obtain the benefit of reduced charges owing to improved methods of manufacture.

In further cross-examination, witness said he knew nothing about the price of ordinary Lancashire coal suitable for the manufacture of 14-candle gas. The cannel used at Salford was not of very high class. He believed the proportion of cannel used was about 40 per cent. Coke, where cannel was used, was not nearly so good as where nothing but ordinary coal was employed. If the cannel was replaced by ordinary coal, more valuable coke was obtained; and whatever saving was effected by this change the Corporation were quite willing that the consumer should have the benefit of it. They would be forced to make a reduction from the fact that their consumers, as ratepayers, were the owners.

Mr. HUTCHINSON: Is it not a fact that you would get just as much 14-candle gas from 17 cwt. of coal as you would get of a higher power gas from a ton of coal? First of all, you make a big saving by discontinuing the use of cannel, then you get a more valuable coke, and you get as much gas from 17 cwt. of coal as you now get from a ton?

Witness: Yes; but whatever the saving may be, whether large or small, it will to a great extent go to the consumer.

It was put upon me yesterday by Mr. Woodward that two reasons why a high price should be charged for gas at Worsley were, first, the leakage, and, secondly, the length of the mains. Do you attach any importance to the length of mains?—Yes, I do.

Is it not a fact that wherever in Worsley the Corporation of Salford have been asked to supply gas they have required a guarantee from the District Council on account of these mains?—Not in my time, certainly.

But I have a letter here dated Dec. 11, 1898, addressed to you, and your reply, in which you say that the lamps asked for will be supplied on condition that the Council agree to pay an annual sum equal to 7 per cent. of the cost of the mains, which was £46 15s., until the consumption reaches a certain quantity?—That was an exceptional instance. I do not know another.

Mr. *Charles Carpenter*, M.Inst.C.E., the Chairman of the South Metropolitan Gas Company, examined by Mr. FITZGERALD, said he had inspected the gas-works at Salford. They were very well arranged indeed, and in admirable order. He considered it was essential that additional land should be acquired. He thought the site an admirable one in every respect. If they could get land adjoining the existing works for the purpose of enlarging them, in the long run it was the cheapest thing to do.

Mr. FITZGERALD: You are aware of the proposals in the Bill as to the reduction in the illuminating power of the gas. In your opinion, is this desirable?

Witness: It is eminently desirable. The Company with which I am connected were the prime movers in the endeavour to get Parliament to reduce the standard of illuminating power. For many years the Company were opposed; but eventually, owing to the greatly increased use of the incandescent burner, they obtained authority. This was in 1900, when we asked for a reduction from 16 to 14 candle power.

A great many objections were urged against it at the time?—Yes; quite unfounded, as events turned out.

It was said that the amount of money consumers would have to spend in endeavouring to light their houses would be considerably increased?—Yes; but I may say the result of nine years' experience of lower illuminating power is that in no sense whatever is it hurtful to the consumers. Those consumers who get their gas by the slot meter take considerably less gas than they did nine years ago.

The objections urged against the reduction were not well founded?—Absolutely unfounded.

The apprehension that it would lead to an increased expense to the consumers of gas has been wholly unfounded?—Wholly unfounded. We have never been in a better position with regard to complaints of consumers than since 1900.

The question as to the proper burner to be used has been fully considered by Parliament; and the burner prescribed has been adopted by your Company?—Yes. The burner question arose at an inquiry in 1905, instituted by the London County Council in reference to gas-testing in London. The Council selected a special burner and specified the power of gas with which it should be used. A Committee of your Lordships' House decided that the method was wrong; and as a result of the inquiry a burner was made which did not exist before, and was called the No. 2 "Metropolitan" burner. The main feature of it is that the air is controlled by a damper, which can be raised or lowered. The advantage is that you can test a gas of low quality—11 or 12 candles—and you can test one of 18 or 20 candles, by simply regulating the amount of air admitted to the flame.

You know that additional gas-testing stations are asked for in the petition against the Bill?—In my opinion, they are quite unnecessary. I consider that the gas supplied in the borough and outside Salford is adequately tested at the testing-station already existing.

In cross-examination by Mr. VESEY KNOX, witness said that, in his opinion, the competition of the electric light did more to bring down the price of gas than all the sliding-scales in the world.

In cross-examination by Mr. HUTCHINSON, witness said if a company came to Parliament for sanction to borrow a sum of £250,000, they would get power to raise this amount *plus* whatever premium might attach—*i.e.*, subject to the auction clauses.

Mr. HUTCHINSON: I want to put to you a question about this burner. Is this the sort of burner you would put in the dockers' houses on the south side of the Thames?

Witness: No.

Suppose you did so, what would it cost?—The cost of the burner is between £2 and £3.

How many burners like this would a docker want? (Laughter.)—I don't know whether you are trying to draw me off on a side-issue.

No, I am asking a very pertinent question?—Then I will answer you. This burner is a scientific piece of apparatus, to be used in a scientific manner by scientific people. The scientific people who use this burner are people accustomed to the use of scientific appliances, of which this is one. There are scientific people who test the quality of tea. They use a balance for that purpose which would cost £20 or £30. Afterwards, when that tea came to be sold, it would be weighed on scales which probably cost only 5s. This is a piece of scientific apparatus for analyzing and discovering what is the true value of the gas. A burner for the use of the consumer of the gas on the same lines could be made for a little over 1s.

May I suggest that this burner is incomplete. Is not the light affected by the pressure?—Yes.

So that as the pressure varied the honest housewife would have to go on twiddling this thing up and down. It is incomplete without an automatic governor. May I read you an extract of a speech that you made to your shareholders, as reported in the "JOURNAL OF GAS LIGHTING" on Feb. 16 last? Did you use these words:

> The basis of our working is, as you know, the supply of gas of 14-candle power. We got permission to come down to that quality some years ago on account of, among other reasons, the increasing use of gas for other purposes than direct illumination. And while the average quality of gas which we are able to supply by our present method of manufacture is about 16·4 candles, the average we should supply if we knew how to do it would be 14·4 candles. Unfortunately, we do not know how to do it. Now the money value of the 2 candles difference between 14·4 and 16·4 is a very considerable one. It has been put at as much as 1d. per candle; and if it were 1d. per candle, this would be £100,000 a year. If it were ½d., of course, it would be £50,000. But at any rate I have said enough to enable you to appreciate that it is a very large sum indeed. As manufacturers of gas, we have exhausted our efforts to introduce a 14·4-candle gas.

Is that correct in every respect?—In every respect.

Mr. TYLDESLEY JONES: When you got this reduction in 1900, you were put under terms to give free burners within a certain period?

Witness: I think we offered to do it. It was included in the Act; but I think the proposal came from us.

Can you tell me what the period was?—It was within two or three years.

Mr. FITZGERALD (re-examining): Have you taken the trouble to ascertain the amount of profit per 1000 cubic feet of gas sold by the Salford Corporation?

Witness: Yes; for the last ten years. I find the average amount of profit in Salford is 9·59d. per 1000 feet, and in London 10·68d.

In Salford they work for a lower return on the money invested in the undertaking?—Yes.

In comparing a municipality with a company you treat the sinking fund as part of the capital?—Undoubtedly; I should almost think it was unarguable.

In a gas company the sum represented by the sinking fund would go as dividends to the shareholders?—That is so.

With regard to the incandescent burner, although it has been the cause of a great reduction in the consumption of gas, it has been an advantage to the companies?—It was an advantage the value of which we cannot possibly over-estimate.

It has enabled them to compete successfully with electricity as an illuminant?—Yes, in almost every sphere in which electricity is used as an illuminant, except in the houses of the very wealthy.

It enables you to do that because you can give, by its means, a better light without increasing the price in any way?—That is so. And on this point I think I may say that there is a great advantage in using with incandescent mantles a gas of 14-candle power rather than a richer gas, because it is more easily regulated. I think you may see that for yourselves in London. In the streets north of the Thames you will see a good many mantles are rather black at the top. It is impossible to find a similar mantle in the streets of South London. The reason is that the gas in South London is of lower quality, and more easily adjustable to the proper amount of air.

Mr. *H. E. Jones*, M.Inst.C.E., expressed his concurrence with previous expert evidence.

In reply to Mr. VESEY KNOX, witness said he did not think the amount the Salford gas undertaking was contributing to the relief of the rates was very much out of the way.

Mr. HUTCHINSON: If Worsley had four corporations to which it could go for a gas supply in bulk, it would be on the velvet, wouldn't it?

Witness: I cannot say.

Therefore I suggest that you have overlooked one strong circumstance—viz., supply in bulk?—If you want a supply in bulk, you cannot do better than make arrangements with Salford.

For how much would you advise Salford to supply us?—I should want to consider that.

We should get off a little better than 2s. 5d.?—It may be.

Mr. FITZGERALD: You know that Worsley consumes about 3 per cent. of the total gas manufactured?

Witness: Yes.

Is it at all probable that they could manufacture gas for themselves at as low a price as they are getting it at from Salford?—No.

Alderman *F. S. Phillips*, the Chairman of the Salford Corporation Gas Committee, in reply to Mr. FITZGERALD, said he was prepared to give the Committee a solemn pledge that, if they were allowed to reduce the standard of the gas, whatever savings were effected on the cost of manufacture would be, as far as possible, divided between the consumers of the whole district inside and outside the borough.

Mr. *L. C. Evans*, the Town Clerk of Salford, was called to explain the meaning of the "Borough Annuity Fund." He said the original borough of Salford purchased the gas-works in 1831, and had expended a large sum upon them up to 1853, when two new townships came into the borough. It was then agreed, by Act of Parliament, that these two townships should contribute to the original borough £2530 per annum as their contribution towards the money that had been expended by the old borough. It therefore represented capital that had been spent by the old borough.

In cross-examination by Mr. VESEY KNOX, witness proceeded to refer to the Corporation accounts in some detail.

The Committee adjourned until yesterday.

AMMANFORD GAS BILL.

This Bill was down for consideration on Tuesday last before a House of Commons Committee, presided over by the Hon. A. Stanley. As will be seen from our "Notes from Westminster," however, the parties came to an arrangement, and opposition was withdrawn.

HECKMONDWIKE AND LIVERSEDGE GAS BILL.

The Unopposed Bills Committee of the House of Commons had the above Bill before them last Thursday. Mr. Alfred Emmott (the Chairman of Ways and Means) presided.

Mr. Berry (of Messrs. Sherwood and Co., Parliamentary Agents for the promoters), who stated the case for the Bill, pointed out that the promoters were adopting the more modern practice of a sliding-scale in place of the maximum dividend; and they were seeking to give a supply of power gas. By clause 4 they proposed to manufacture gas "from coal, peat, oil, or other materials yielding gas;" but the Committee altered this to "from coal or oil." The Company had given a supply of gas at 2s. 6d. per 1000 cubic feet, and at 2s. 4½d. for public lamps. They now proposed a standard price of 3s. 3d.

Mr. *E. H. Stevenson* remarked that the Company had charged 1s. 11d.; but they were now asking for 3s. 3d., because in their particular district all the coal seams were thin, and the new Act would certainly increase the price of coal there. It was generally admitted that the price of gas coal must rise. He did not think, however, that anybody would be hurt if the price were made 3s.

The Committee agreed to do this.

The Chairman, with regard to the supply of Mond gas, pointed out that no price was fixed, and there was no sliding-scale or anything else. He asked what evidence could be produced that Mond gas was required.

Mr. Berry replied that it was a large manufacturing district, and there was a field for such a supply, having regard to the amount of power used in the area.

Mr. Moon (Speaker's Counsel): If Mond gas can be supplied at a profit, this is a district in which it may be supplied. This is as high as you put it?

Mr. Berry: Yes.

The Committee decided that they would wait until it became a matter of practical politics; and the Bill, with the alterations indicated, was ordered to be reported.

YORKTOWN AND BLACKWATER GAS BILL.

House of Commons Committee.—Monday, April 26.

(*Before Mr.* Rose, *Chairman, Major* Renton, *Mr.* Agnew, *and Mr.* C. Harmsworth.)

The above Committee resumed consideration to-day of the Bill promoted by the Yorktown and Blackwater Gas Company, the opening proceedings in which were given in the "Journal" last week (p. 237).

Mr. Balfour Browne, K.C., Mr. Vesey Knox, K.C., and Mr. Henry Lynn appeared on behalf of the promoters; Mr. Honoratus Lloyd, K.C., Mr. C. C. Hutchinson, and Mr. Jeeves represented the Aldershot Gas and Water Company, who petitioned against the Bill. Mr. Jeeves also appeared on behalf of the Easthampstead Rural District Council.

Mr. *Sellon*, in further examination by Mr. Vesey Knox, said it would be more economical for the Yorktown Company to supply electricity in Frimley than for the Aldershot Company, because that part of the district was practically the suburbs of Yorktown, whereas the Aldershot Company would have to lay extensive mains in order to give the supply.

In reply to Mr. Hutchinson, witness said his experience was that the best solution of such a question as this was to put an electricity undertaking in the hands of a gas company. One great advantage, from many points of view, was that both undertakings were under one administration and at one expense. The gas-works of the Yorktown Company were more advantageously situated for the supply of electricity than those of the Aldershot Company. There was no doubt that where they had an electrical undertaking in a district capable of supplying current to be transformed, there would be competition with the existing gas undertaking in the district. He was not aware that the Frimley Council were willing that the Aldershot Company should include the whole of their district for the supply of electrical energy.

Replying to Mr. Jeeves, witness said he could not point to any precedent in Parliament where such powers as they were now asking had been granted in face of opposition by the local authority. The length of the main to be compulsorily laid in the Easthampstead rural district was about three-quarters of a mile. This main would be practically of no use in the district except for the supply of the War Office property, which included the Staff College. Under the proposals of the Bill, he anticipated a revenue of £2343.

In reply to Mr. Harmsworth, witness said that the Aldershot Company proposed erecting a generating station in the Frimley district for the purpose of supplying with electricity the area which both Companies sought the right to serve; but he held that, even then, the Aldershot Company would not be able to give the supply so cheaply as the Yorktown Company. Comparing the prices of gas and electricity, with an average price of 4½d. for electricity and 3s. 9d. per 1000 cubic feet for gas, on behalf of electricity he said they would be able to compete.

Mr. *Arthur Valon*, recalled, said that the large majority of the gas consumers of the Yorktown Company used slot-meters, and up till Christmas last the price charged to them was lower than that charged by the Aldershot Company. The latter, however, had now reduced their price to something less than 4s. per 1000 cubic feet; whereas the price charged by the Yorktown Company was 4s.

This closed the case for the promotors of the Yorktown Bill.

Mr. Jeeves then proceeded with the petition of the Easthampstead Rural District Council.

Mr. *C. H. Ferrard*, the Chairman of the Council, said that even in five or six years the district would not be ripe for the supply of electricity. Power should not be given to a company to supply. But when rights were given, they ought to be accompanied by obligations. When a company was not willing to undertake such obligations, it was a distinct indication that they ought not to have the rights granted to them. If the rights were given, a larger compulsory area should be inserted in the Bill; but so far as they could ascertain, there was no demand for electricity.

Mr. *J. Wilson*, the Clerk to the Council, said the Camberley Company applied for electrical powers for the area now in question; but it would have been in competition with the Gas Company. As a condition of the granting of the electrical powers, it was agreed that they should lay a compulsory main in Sandhurst and Crowthorne; and if that main had not been laid, the Council would have been in a position to apply for a revocation of the Order. They did not oppose the Order, but insisted on the laying of a longer compulsory length of main. He held that if the powers were granted the undertaking would be unprofitable, and that the gas consumers would suffer thereby. The proper time for the promoters to come for the powers now sought would be five or six years hence.

Mr. Jeeves, in addressing the Committee on behalf of the Rural District Council, said that, on the one hand, the gas consumer in the Council's area might have to pay directly because of loss in the electricity undertaking, and he might have to pay by reason of competition. He held that the possibility of competition should not be set aside unless the Gas Company could offer such terms as would show that they could thoroughly well serve the district in the matter of electricity as well as in the gas supply.

ALDERSHOT GAS AND WATER COMPANY'S BILL.

Tuesday, April 27.

When the Committee met this morning,

Mr. Hutchinson proceeded with the case for the above-named Bill.

Mr. *R. W. Edwards*, the General Manager and Secretary of the Company, said the main objects of the Bill were the extension of the gas limits, additional gas-works, authority to supply power gas, power to supply electrical energy over an area coterminous with the gas area, the construction of additional water-works, the consolidation of capital and the granting of additional capital, and other smaller provisions. There were two small non-statutory Gas Companies at present supplying gas with whom they had made terms of purchase by agreement; the price charged by them being 4s. 6d. and 5s. 10d. per 1000 cubic feet respectively. The works of these Companies were scheduled to the Bill as gas lands for manufacture and distribution; and it was the intention of the promoters to merely use the lands for storage purposes. In 1896, they purchased the undertaking of the North Camp Company, including their powers. In part of the area now contested, the Yorktown Company were supplying the church, the schools, and the drill-hall; but they offered no opposition. In 1901, the Directors of the Aldershot and Yorktown Companies arrived at the conclusion that it would be wise to amalgamate the two undertakings; and they applied to Parliament for confirmation of the agreement. But the agreement was not confirmed, on the opposition of the Aldershot Urban District Council, who held that the amalgamation would result to their disadvantage. In 1903, the Aldershot Company applied to the Board of Trade to raise further capital under opposition by the Yorktown Company, who were then supplying, though not authorized to do so, in the contested area. The result of the opposition was the insertion of a clause the effect of which was that in part of the contested area, though the Aldershot Company had mains there, they were required not to supply, unless they could do so without the expenditure of capital. In 1904, the Yorktown Company came to Parliament and then legalized their position with regard to Sandhurst and the supply of gas in bulk to the Military College; but as they did not propose to touch any part of the Frimley district, the Aldershot Company did not oppose the measure. The Aldershot Company's standard price was 3s. 8d. per 1000 cubic feet, subject to the sliding-scale. The price they were supplying at in Aldershot and Frimley was 2s. 6d., and in the urban districts 3s. 2d. for lighting and 2s. 9d. for other purposes. Upon these figures they were in a position to compete for the War Office contract; and if their powers were preserved to them in the district, they would be able to favourably compete. Calculating on the rate of increase of the past ten years, they arrived at an estimated increase of 240 million cubic feet. They were seeking authority to supply power gas. For pumping their own water they were using power gas, and there were mills in close proximity who would take it. At present, in Aldershot they supplied from 40 to 50 million cubic feet of gas per annum to the War Department for lighting, heating, and power. With regard to electrical supply, from the gas engineer's point of view this was an area where it would be advantageous if the powers for the supply of gas and electricity were coterminous. They were seeking to repeal the powers of the Ascot Company over certain parts of their area. Competition with gas or electricity was bad; but competition in bulk supply of gas was necessary. When the last War Office contract was made, the Aldershot Company tendered at 2s. 2d. per 1000 cubic feet, and the Yorktown Company at 2s.; the latter being successful. The Aldershot Company had no objection to competition for this contract so far as the Staff College was concerned; but they did object to competition for the War Office contract in the rest of their district. He did not agree that they were fighting to take away from the Yorktown Company the War Office contract, which was a fifth of their supply, and then to buy them up.

Replying to Mr. Hutchinson, witness said that, with regard to the contested area, for the purposes of the War Office contract, whether

for gas or electricity, both Companies should have concurrent and equal rights.

Mr. *Charles Hunt* said he had examined the books, and found that the Aldershot Company could manufacture gas into the holder at 5d. per 1000 cubic feet less than the Yorktown Company, which placed them in a better position for competing for the War Office contract. From the War Office point of view, the Aldershot Company were a very valuable source of competition. The contract was an important matter; but he did not think it was of vital importance to either Company. Supposing the Yorktown Company lost the contract, there might be a loss on their undertaking for a year or two; but this would very soon be overtaken, having regard to the rate of increase of their business.

Replying to Mr. VESEY KNOX, witness said the Yorktown Company were supplying at a lower price than they really ought to in justice to their own customers. He was against competition; and the Aldershot people were in a better position to supply the War Office than the Yorktown Company.

In answer to the CHAIRMAN, witness said he did not think the War Office should have the benefit of competition, because there was a temptation on the part of one Company to undersell the other, and sell gas at a price which might do injustice to the ordinary consumers. He would consider the Aldershot Company hardly treated if they were deprived of the district.

The CHAIRMAN: You do not object to competition so long as your competitor is taken out of the way?

Mr. *Mountain*, an electrical engineer, of Huddersfield, gave detailed evidence with regard to the electrical scheme.

Mr. *E. B. Taylor* said that, for the purposes of the water proposals in the Bill, the necessary capital was £54,000.

Mr. HONORATUS LLOYD then addressed the Committee on behalf of the Aldershot Company, and in opposition to the Yorktown and Blackwater Company's Bill. The Committee, he said, should maintain to them such rights in these areas as would enable the Aldershot Company to compete for the War Office contract and give the supply. The one desire of the Yorktown Company was to get rid of the Aldershot Company in the area where the War Office buildings were situated, so that they would not have the competition. He held, on the other hand, that, under the special circumstances of the case, both Companies should have equal powers. He also objected to the Yorktown Company altering their name so as to include Camberley, because the Aldershot Company supplied a large portion of that district.

Mr. VESEY KNOX, in addressing the Committee on behalf of the Yorktown Bill, said that competition for the War Office contract was to the disadvantage of every consumer in the district, as well as to the disadvantage of the shareholders of the small Yorktown Company. If the Aldershot Company got rid of the Yorktown Company in the contested area, and they were unable to compete for the War Office contract, they would drive the Yorktown people to sell their undertaking to them. The competition for this contract should be done away with, and the Yorktown Company should be left in the area. If this were done, they would insert a clause for the protection of the War Office.

After the Committee had consulted privately for some minutes,

The CHAIRMAN announced that for the sale of electricity the area of the two Companies would be divided. With regard to gas, the Committee unanimously confirmed the Yorktown Company's rights to supply in the contested area, and that no special privilege was to be given to the Aldershot Company to tender for the War Office contract. As to Mond gas, they asked that a clause should be inserted to satisfy the Committee—showing that it should be kept as separate as possible, so that no loss should fall on the shoulders of the gas and water consumers. As to Easthampstead, they were unanimously of opinion that the area for compulsory powers should be extended, giving them a period of (say) five years for a larger area. Subject to this, they approved the preamble of the Bills, which would be proceeded with.

Wednesday, April 28.

The Committee met again to-day for the purpose of considering the clauses of the two Bills.

Mr. VESEY KNOX brought forward a new clause, which was as follows:

So much of the Order of 1877, the Order of 1890, and the Act of 1896 as authorizes the Aldershot Company to supply gas in or for use within so much of the parish of Frimley as is included within the area not defined by the section of this Act of which the marginal note is "Extension of Gas Limits," is hereby repealed, and from and after the passing of this Act no gas shall be supplied by the Aldershot Company in or for use within so much of such parish for any purpose whatsoever; and all the powers of the Aldershot Company with reference to the supply of gas within so much of such parish shall cease and determine.

Mr. HUTCHINSON said they did not understand the decision of the Committee to affect the power to supply in bulk by the Aldershot Company.

Mr. VESEY KNOX said the decision was that the Yorktown Company were to have the right to supply in the area where the War Office property was situated. The Aldershot Company's powers to supply gas there were repealed, and they were to have no special privilege to compete for the War Office contract. They were now trying to alter the clause so as to get behind the decision of the Committee and compete for the contract.

The Committee decided that the new clause should be inserted in the Yorktown Bill.

Reduction in Price at Walton-on-Thames.—The Walton-on-Thames and Weybridge Gas Company announce a reduction in the price of gas of 1d. per 1000 cubic feet, as from the Lady-day quarter—making the charge 3s. 8d.

Failure of Gas at Wigton.—Last Sunday week, through the bursting of a pipe, the gas-main at Wigton was, it is stated, flooded with water, in consequence of which the town was without gas. On the following day, however, the water was pumped out of the main, and matters were thus put right.

MISCELLANEOUS NEWS.

EXAMINATIONS IN GAS SUPPLY.

The City and Guilds Question Paper.

In the "JOURNAL" last week (p. 244), we published the question paper in the examinations in "Gas Engineering" conducted by the City and Guilds of London Institute. We now give the questions submitted by Mr. J. H. Brearley in "Gas Supply," the examinations in which subject were held last Saturday. In the case of the questions marked with an asterisk, sketches had to be used; and the candidates were advised to make them wherever possible and pertinent, as they would enhance the value of their other answers. Not more than eight of the numbered questions, and only one of the alternative questions, were to be attempted in the four hours allowed for the paper in each grade.

ORDINARY GRADE.

* 1. Describe the following: (*a*) Ratchet stock, (*b*) Venturi tube, (*c*) a well-constructed gas-cock, (*d*) one form of thermostat, (*e*) Forster pipe-joint. [39 *marks.*]

2. What are the advantages and disadvantages of gas and air adjusters as applied to (*a*) inverted incandescent gas-burners and (*b*) gas-fires? What precautions should be taken in each case when installing inverted burners or gas-fires to ensure satisfaction in use to the consumer? [39.]

3. Describe fully the cycle of operations that takes place in the cylinder of an "Otto" type gas-engine. If a gas-engine slowed down and finally stopped, how would you proceed to locate the fault? [39.]

4. A series of empty rooms are each illuminated with (say) a 100-candle power inverted burner. The walls and ceiling of each room are papered or painted with one of the following colours: (*a*) Yellow, (*b*) black, (*c*) brown, (*d*) blue, (*e*) white, (*f*) chocolate. State in each case what percentage of the rays of light falling upon the surface of the ceiling and walls will be reflected. What is the influence of dirt on reflection, and to what approximate extent would it affect the reflecting power of a yellow paper after five years' use in a residence situated in a manufacturing district? [39.]

*5. Describe the construction of one form of (*a*) upright and (*b*) inverted incandescent burner by means of which "lighting-back" is effectually overcome. What effect has "lighting-back" on the combustion of gas and its products? [39.]

6. Describe fully (*a*) the cause of drawn lead joints, (*b*) the method of preparing, and the tests to be applied to, a cement mortar for gas-main joints, and (*c*) the means you would adopt of demonstrating to a consumer that the pressure of gas at his meter inlet is always adequate for his requirements. [39.]

7. (*a*) Why is fire-clay used for the fuel of gas-fires and for the lining of the back and sides? Which is usually the best method of connecting the flue-pipe of a gas-fire to a chimney constructed for use with a coal-fire, and what are the principles that determine such a form of connection? [36.]

or, (*b*) What is the cause of oven burners "smothering" out? What means would you employ for ascertaining whether there was deficient or excess ventilation—*i.e.*, air passing through the oven? [36.]

*8. (*a*) Give sketch in section of a station governor, and explain how the pressure in the district is controlled. Describe the construction of the valve you consider most suitable for use with governor connections. [36.]

or, (*b*) What are the considerations that determine the employment of district governors? Explain, by the aid of a sketch in sectional elevation, the use of a differential district governor. [36.]

9. (*a*) State the best form of movable pendant for (*a*) drawing-room and (*b*) workman's bench. Give in each case the points of construction and conditions in use that determine your preference for the type selected. [36.]

or, (*b*) Describe two forms of anti-vibrator suitable for street-lanterns; state which you prefer, and why. In what way may rubber tube connections become disadvantageous? [36.]

10. (*a*) Explain the constructional features and advantages in use of any two of the following: (*a*) Macfie's governor meter, (*b*) Thorp's discount meter, (*c*) Valon's stop meter. [36.]

or, (*b*) What means are employed in wet meters for preventing "slow" registration? Give one method of maintaining an unvarying water-line in wet meters. [36.]

HONOURS GRADE.

1. (*a*) Particulars of the information required in answer to this question accompany diagram No. 1 in the folded sheet printed in grey which is given you.† The answer must be written in the space provided on that sheet, which must be inserted in your answer paper. [39 *marks.*]

or, (*b*) See diagram No. 1 on the folded sheet printed in grey for particulars of this alternative question. All the particulars required must be written on the sheet containing the diagram, except the specification, which must be written on the last page of your answer paper, in which the diagram sheet must be inserted. [39.]

2. Diagram No. 2‡ indicates the contour of road, distances and sizes of mains laid in the road, which is situated in an outlying district. At point A [on the datum line], a 6-inch gas-main is joined to a 3-inch main, at point B [one mile distant, and 200 feet above the datum line] the size is increased to 4 inches, and at point C [half-a-mile farther, and 50 feet below datum] it is again reduced to 3 inches. With the

† This diagram was supplied in order to economize the candidate's time, and was a ground floor and first floor plan of an eight-roomed house. The candidate had to use this for the insertion of certain particulars as to pipe running, &c.

‡ This diagram and those referred to in the next question were given in the examination paper.

minimum draught on the mains, the gas pressure at point B is 5 inches; but at maximum draught (for four calendar months in the year) it is reduced to 6-10ths of an inch. For an approximate distance of 300 yards on either side of point B, the supply is then inadequate for the consumers' requirements. Explain fully two remedies, state which you prefer, and why. The answer must pay due regard to first cost and cost of maintenance. [39.]

3. (*a*) To upright burners of the "C" type an opal dome shade and a squat opal shade are fitted. Show by curves the effect on the hemispherical illumination (*i.e.*, throughout a vertical arc of 180°) in each case as compared with the illumination given by the respective burners *minus* such glassware. What is the relative effect upon the lower hemispherical intensity of (*a*) glass shades and (*b*) metal ring and rods when used for the purpose of carrying reflectors? [39.]

or, (*b*) Plot a light-distribution curve of (*a*) any inverted gas-burner with which you are familiar, and (*b*) any filament electric lamp. Explain how the candle power has been ascertained. How may the results at any given angle be modified in the construction of the inverted gas-burner? [39.]

*4. State the guiding principles of good schoolroom illumination. A schoolroom 20 feet wide, 30 feet long, and 12½ feet high contains separate desks for 12 students and a teacher. The desks are 2½ feet high. What lighting arrangements would you employ so as to maintain an approximately even illumination of 2·5 foot-candles upon each desk surface, and what would be the number, candle power, and height from the floor level of the light units employed? A simple sketch in plan must be used to show the relative position of desks and lights in the system adopted. [39.]

5. (*a*) What is the nature of the damage to gas-mains caused by electrolysis and electric fusion? What are the best preventatives (*a*) in the case of existing gas-mains and (*b*) in the operation of laying new gas-mains? [39.]

or, * (*b*) What methods may be employed for connecting wrought-iron services to Mannesmann steel mains? Show by sectional sketch the form of joint you would adopt, and give reasons for your preference. [39.]

6. Describe a method of automatically lighting and extinguishing street-lamps in which pressure from the distributing governors does not form part of the operation. The appliance described must be adaptable to an inverted burner street-lamp, the method of fixing to which must be fully explained, together with the precautions necessary for efficient working. [36.]

7. What purposes do indicator diagrams serve in gas-engine practice? Show diagrams, and explain the effect on the respective curves of (*a*) a contraction in the exhaust-passages or an obstruction in the exhaust-pipe, (*b*) pre-ignition, and (*c*) late ignition. [36.]

8. Give a list of the types (not makes) of gas wash-pans or boilers with which you are conversant. To what efficiency tests would you subject them when making a selection, and upon what constructional and other points would your preference for any particular one be determined? [36.]

9. (*a*) What is the catalytic theory of the luminosity of incandescent mantles? What precautions must be observed in order to obtain the maximum luminosity from a given quantity of gas in a low-pressure burner? [36.]

or, (*b*) How is the incandescent gas-mantle made? What is its composition, and what is the effect of each component on the functions of the mantle? How would you test a mantle for efficiency and durability? [36.]

*10. What are the constructional points to be observed in a gas-fire in order to effectively remove the combustion products? Show by sketch in sectional elevation and describe what you consider the best means of conveying the products from the point of combustion to the point of discharge in the chimney of an ordinary fireplace. [36.]

Library Lighting by Gas and Electricity.

At the meeting of the Lambeth Borough Council last Thursday, the Libraries Committee reported that they had had under consideration the advisability of wiring the Carnegie Library. With regard to the libraries already wired, the Committee had been asked to fix the annual sum which should be charged against the Libraries Department for the supply of current. The following is a comparison between the cost of lighting with gas and electricity so far as can be ascertained from experience gained up to the 31st of March last: Tate (Central), average annual cost of gas, calculated on the three years ended March 31, 1907, £112; electricity, at 3½d. per unit, for the year ended March 31, 1909, £159. West Norwood, gas £36, electricity £74; Durning, gas £42, electricity £90 (estimated, but £80 was the actual cost from June 3, 1908); Tate (South Lambeth), gas £52, electricity £115 (estimated, but £48 was the actual cost from Nov. 24, 1908); total, gas £242, electricity £438. It was explained that the average annual cost of gas included that supplied to the stoves; and this would still be continued in addition to the cost of electric lighting. The Committee went on to say that the figures given above did not represent the relative cost of gas and electricity, as the volume of light supplied might not be the same in each case. The price of gas at present is higher than it was during the three years ended March 31, 1907. On the other hand, the cost of maintenance (electric lamps, &c.) will be greater than the renewal of mantles and globes, though it is said that electricity will possibly reduce to some extent the cost of cleaning and redecoration. Bearing in mind that it was only at the suggestion and for the convenience of the Council that electric light was installed in the libraries, the system of gas lighting previously in operation having been perfectly satisfactory and efficient, the Committee decided that the Libraries Committee should be only debited yearly with the average cost per annum of the gas supplied to the four libraries during the three years ended March 31, 1907.

Cheaper Gas at Darwen.—At last week's meeting of the Darwen Gas Committee, it was decided to reduce the price of gas 3d. per 1000 cubic feet from July 1. Gas for street lighting was also reduced to 2s. per 1000 cubic feet—this being equal to a reduction of 5d.

GAS-WORKS SIDINGS AND RAILWAY RATES.

RAILWAY AND CANAL COMMISSION.

(*Before Mr. Justice* A. T. Lawrence, *the Hon.* A. E. Gathorne-Hardy, *and Sir* James Woodhouse.)

Corporation of Birmingham v. Midland Railway Company, London and North-Western Railway Company, and Great Western Railway Company.

Fifth Day.—Friday, March 26 (*Continued*).

This was a case in which the Corporation of Birmingham, who have constructed extensive private sidings at their Saltley, Nechells, Windsor Street, and Swan Village Gas-Works, asked for an order declaring them entitled to an allowance or rebate on charges made by the Midland, London and North-Western, and Great Western Railway Companies on inward and outward traffic to the various works. They also asked for a declaration that the London and North-Western Company had exceeded their maximum charge for the use of trucks. Further, they claimed damages in respect of the past six years' overcharges. The earlier proceedings were reported on pp. 105, 167, 240.

The following were the Counsel engaged: For the Corporation: Mr. Balfour Browne, K.C., Mr. J. A. Foote, K.C., Mr. A. H. M'Cardie, and Mr. J. B. Worthington (instructed by Messrs. Sharpe, Pritchard, and Co., Agents for Mr. E. V. Hiley, Town Clerk of Birmingham). For the Midland Railway Company: Sir Alfred Cripps, K.C., and Mr. L. Macassey (instructed by Messrs. Beale and Co.). For the London and North-Western Railway Company: Sir Alfred Cripps, K.C., Mr. J. A. Simon, K.C., M.P., and Mr. J. B. Aspinall (instructed by Mr. C. de J. Andrewes). For the Great Western Railway Company: Sir Alfred Cripps, K.C., Mr. J. A. Simon, K.C., M.P., and Mr. Harold Russell (instructed by Mr. R. R. Nelson).

A Corporation Witness Interposed.

Mr. *John Foster*, Engineer-in-Charge of the Windsor Street Gas-Works (whose evidence for the Corporation was interposed at this stage of the Railway Companies' case), examined by Mr. Foote, said he had been in superintendence of the works for six years. With regard to the number of empty coke-waggons put into the works by the London and North-Western Railway Company, the maximum in winter might be some 50 a day, and at other times about 30. In addition to this, there were (say) two trucks a day of lime and oxide, two of fire-clay, and three for miscellaneous goods. This made seven altogether for inward traffic other than coal. There was in the case of this Company no question with regard to a rebate on coal, as that was already given; but he might mention that 82 trucks a day was the maximum for coal going in. The general traffic to which he had referred was dealt with in the same way as the coal—put into the same sidings, by the same engines. The coal was backed by the Company into sidings; and the coke-waggons were as a general rule placed by the Corporation locomotive on the Company's siding. Under ordinary circumstances, the coke traffic could certainly be dealt with in this way; but there were occasions when it was very heavy, and when the Company could not take the traffic away in a reasonable time, and then the Corporation locomotive ran over the Company's lines and took the waggons to the marshalling place.

Cross-examined by Sir Alfred Cripps: It had happened two or three times the last twelve months that the Corporation had taken out the coke-waggons and put them on the marshalling siding. It was then done for the convenience of the Company, and not for that of the Corporation. Each time this occured, the Corporation locomotive was off the works for a period of about twenty minutes. The inward miscellaneous traffic was first of all brought into the Company's sidings below Avenue Road, and then backed on to the Company's siding connecting the railway system with the works. They arrived at the first sidings mixed up with other traffic.

Evidence for the Railway Companies.

The Midland Railway Case.

Mr. *John Thompson*, Depôt Master and Traffic Inspector of the Midland Railway Company at Birmingham, in answer to Mr. Macassey, said he was acquainted with the method of working the traffic of the Corporation into and out of the Saltley and Nechells Gas-Works. Coal destined for the works would come down to Washwood Heath sidings either in mixed or in full trains. In the case of a full train, if they were sure of getting it delivered straight away into Saltley or Nechells, it would pass outside Washwood Heath sidings, past Saltley Station, to the works. If it was necessary that a full train should be stopped at Washwood Heath sidings, it would remain there until it was possible to send it down to Duddeston Mill sidings or the connecting sidings to the works. In the case of Corporation trucks in mixed trains, the train-engine had to remain until the whole operation of shunting was over, so as to get the waggons on the proper sidings. A shunting engine dealt with the other traffic; and were it not necessary for the train-engine to remain and shunt the Corporation traffic, it would be liberated and sent to other duties. After explaining the method in which the traffic was got to the Corporation sidings at Saltley, he stated that in some cases the gas-works officials whistled when they wanted coal. This was when they had emptied the siding entirely. As a rule, however, the Company watched the working of the Corporation engines. No particular siding at Duddeston Mill was reserved for empty coal-waggons coming out of the gas-works. They were distributed into any convenient siding for dispatch. There was a particular siding used for sorting empty waggons for coke that were going into the Corporation reception sidings. The shunting engine at Duddeston Mill sidings made about eight journeys every 24 hours to and from the Corporation sidings; and were it not for the necessity of

passing the Corporation traffic to and from these reception sidings, this shunting engine would not be there at all. The shunting in Duddeston Mill sidings would then be done by the train-engine arriving there. They did not deal with the small miscellaneous traffic of Washwood Heath in the same way as they did with the coal. It was worked into Lawley Street; taken again into Duddeston sidings; and then the shunting engine brought it across from there, just as it would empty coke-waggons. There would be complaints if they locked it up among the coal at Washwood Heath. There were two sidings at Duddeston Mill into which coal for Nechells was put.

Mr. MACASSEY: Those two sidings, as I understand, are allocated specially to gas-works traffic?

Witness: They are very largely used for gas-works traffic.

Justice LAWRENCE: That is probably a better expression—"they are very largely used" for it. We have had evidence that sometimes there is other traffic put in there.

Examination continued: They never put coal into the connecting siding at the works unless they knew there were no empties to come out. There was an arrangement made between the Midland servants at Duddeston sidings and the Corporation employees. If coal was placed on this siding every time it happened to be vacant, no empties at all could come out of the works.

Mr. MACASSEY: It has been suggested that if this connecting siding were made longer, it would in some way or other facilitate the dispatch of the coal into Nechells and its being more quickly cleared by the Corporation. If it were longer, would that in any way enable the Corporation to take the traffic off it more quickly and more frequently?

Witness: It would depend upon their internal arrangements.

In your judgment, does the clearing of this siding depend upon their arrangements inside the works?—Yes; it is worked for their convenience entirely.

Even if the siding were longer, could they work it in any other way?—I do not think they could.

Further examined: The Company kept a special siding at Duddeston Mill for storing empty waggons for the outward traffic of the Corporation; and they generally had a reserve of 35 or 40 waggons on hand for coke. These empty waggons could not all at once be passed into the works; they went in small numbers from time to time as the Corporation people ordered them. The appropriation of the two sidings at Washwood Heath to gas-works traffic imposed very great inconvenience upon the Company. The delay caused by the shunting operations seriously affected the general working. At Duddeston they had to employ three foremen who would not be required but for the special services in connection with the Corporation work; and their wages amounted to £268 a year. These sidings, too, would not be opened on Sunday nights were it not for the gas-works traffic; and the cost of so opening them was about £23 a year. Owing to the passage of traffic in and out of the Saltley works, across the running lines, there was considerable delay to the traffic passing over the main line there. In regard to Washwood Heath, the total delay to engines of all kinds during the week ending Feb. 28 last caused by the method that had to be adopted in dealing with the Corporation traffic amounted to 86½ hours; or deducting the period which it might be suggested was occupied in work which was properly part of conveyance, he put the delay at about 75 hours. At Duddeston Mill, the shunting engine was occupied 155 or 156 hours per week. Though but for the Corporation traffic they would not use this engine, they did, in point of fact, at the present moment employ it for shunting a portion of the other traffic there. For this he would deduct 56 hours; leaving a balance of 100 hours attributable solely to the Corporation. During the time that the Duddeston shunting engine went to the gas-works and dealt with the traffic, it necessarily blocked all the six running lines through Saltley; and 14 hours was the total delay to passing trains by the operations during the week named. This was a very light week indeed; and the delay was much greater as a rule. If the special sidings at Washwood Heath were full of gas-works traffic, it became necessary to hold back the traffic on the journey to that point. As to Mr. Hampton Barber's statement that the Corporation had never received any complaint from the Company that their traffic was blocking the Company's sidings, he (witness) had called at the office on several occasions and complained. On five days during 1908, the number of waggons for the gas-works on hand at Washwood Heath was over 300.

Mr. BALFOUR BROWNE (in cross-examination): You have spoken in part of your evidence of the great inconvenience that is caused to your Company by dealing with our traffic. Do you know as a fact that the Corporation pay to the Company £80,000 a year? You would expect that you would be put to some inconvenience for that, would you not?

Witness: We should expect to work their traffic, I suppose.

I would like to ask about these hours that you have accumulated upon us. How did you calculate that the main line was blocked by our traffic—traffic from our works going over to Duddeston sidings, for 14 hours?—I had a responsible man day and night doing nothing but taking particulars of the delays and the operations in connection with the gas-works traffic.

I take it to mean that we blocked it with coke-waggons going over from our works full to Duddeston sidings, or empty waggons coming over from Duddeston sidings?—Or else the Midland engine putting coal in.

In that case it was your own traffic blocking your own traffic?—It was the gas-works traffic—traffic for the Corporation.

Do you know that when a thing is performed for a trader, he can give the Company notice that he does not require it to be performed? How would you like it if we gave you notice that we did not require you to block the main line? Could you conduct your traffic?—We could conduct it with very much less delay than we do now; and it could be taken into the gas-works.

If we gave you notice, as we are prepared to do at any time, that we do not require you to block the main line, what would you do?—We should have to block the main line, and bring the traffic to the gas-works—work it over the main line. The work we do is done because the gas-works cannot take their traffic in very quickly. We put the traffic in as they can take it.

Cross-examination continued: The sidings at Lawley Street Station were to a certain extent used in the same way for other traffic as those at Duddeston were for the Corporation traffic. If the Corporation consigned their traffic truck by truck, the Company would have to deal with it just as they did with a trader's truck. At Nechells a full train-load was 35 trucks; but at Saltley a full train-load might be 50 trucks. They had at Saltley, by special permission, taken into the works 35 trucks at a time—that was, on the two sidings. If they could take a full train-load at Saltley direct from the colliery, none of the operations that had been mentioned were necessary at Washwood Heath. He could not say whether it was possible for the Corporation to take a full train-load at Nechells. He knew that the coke-waggons were hired by the Corporation from the Company; and it seemed reasonable that if they hired them the Company should send them in. He had, however, included the crossing of these trucks from Duddeston sidings in his calculation of the time the main line was blocked.

Mr. BALFOUR BROWNE: I see you make this extraordinary statement. You said that in the Duddeston sidings for 56 hours in the week named the shunting engine was used for your own purposes, and 100 hours for the purposes of the Corporation. What do you mean by your own purposes?

Witness: Shunting our own trains.

What are your own trains? Are not they trains with public traffic in them?—Yes.

So are the Corporation trains?—I meant not shunting yours—other than Corporation traffic.

You treat the public traffic as your own traffic, and ours as aliens traffic?—I hope not.

Mr. BALFOUR BROWNE: I really do not want to go into this question of the hours' delay. I do not think it is necessary. I will leave the witness there.

Justice LAWRENCE: It is a question of principle. (To witness:) If the trader was ready to receive all his traffic in full trains, would you be desirous of taking it to him in that way?

Witness: We should very much like to take it direct in full trains, if they could take it direct into the Saltley works.

If they could take it direct into the Saltley works, is there any object that you have as a traffic manager in dealing with it otherwise than running it straight on?—Absolutely none. There is no object in taking it into Washwood Heath, except that they do not accept it as it arrives.

Mr. *John Elliott*, Superintendent of the Line of the Midland Railway Company, questioned by Mr. MACASSEY, said the present method of working the traffic to and from Saltley from the Saltley and Nechells works was an inconvenient one, and expensive to the Company. It would unquestionably be more convenient and less expensive to the Company if the Corporation accepted their coal as and when it arrived. The Company had no object in holding the traffic at Washwood Heath instead of taking it down promptly to the works. They were compelled to do it under existing circumstances. It was not possible at present to take the full trains into the Nechells and Saltley works.

Mr. BALFOUR BROWNE (in cross-examination): We hear that since 1896 the Washwood sidings, though there were some there before, have been largely increased. I suppose they were designed and increased in size with a view to getting some increase of convenience out of the working?

Witness: They were never designed for storing coal there for days in connection with the convenience of an intermediate tradesman.

That is not for you to say. There I think you are acting as a partisan. I ask, were they designed for the convenience of the Midland Railway Company?—They were unquestionably designed for the convenience of working the traffic.

Mr. MACASSEY said he had a certain amount of evidence as to the cost to the Company of providing these sidings which were used more or less exclusively by the Corporation traffic, and also evidence as to the expense to the Company of engine power and other services rendered in connection with the traffic. He did not know whether the Court would care to hear it.

Justice LAWRENCE: It seems to me that we have not got to consider the quantum in respect of service at or in connection with the sidings. We only have to consider whether there are such services. In a case of this sort, we cannot go into the question of reasonable amount. I know the decisions have said that in a sense the amount would come into consideration. For example, if we came to the conclusion in favour of Mr. Balfour Browne that there was to be a rebate, there would have to be an investigation into the amount that was attributable to terminal services in respect of which he should get his rebate. You would have to split up the figures, and say how much was attributable to station terminal or terminal service which was not rendered to this freighter, and how much was left as attributable to the other things. I do not know whether the Court is the tribunal to deal with that now.

Mr. BALFOUR BROWNE: I should like to point out, after what Sir Alfred Cripps said, that there is nothing turning upon the question of reservation of sidings. Mere calculation as to what that reserve siding costs can have no bearing. They would need to do this—and I do not suppose they are prepared to do it—to go into the whole cost of the sidings at Washwood Heath and Duddeston, and the whole cost of the independent sidings, and then divide it somehow over the whole of the traffic that used it. That seems to me to be a herculean task that your Lordship should not be called upon to do.

Mr. MACASSEY: That is precisely the evidence I have here, to show what it is in pence per ton of traffic carried by the Midland Railway Company for the Corporation.

Justice LAWRENCE: It will have to be considered at some time if the rebate is to be allowed; but it seems to me that it is premature at this stage to deal with that. There is quite sufficient to be determined here. You have shown us that if there is any service properly called a service at or connected with a siding, then it is a sum of some proportion, I will not say a considerable proportion, because that might seem to be determining something, but there is a sufficient proportion to make it at all events reasonable to say that we would not go into it. If, on the other hand, Mr. Balfour Browne establishes his case, that there is some portion of what you are charging that ought to be regarded as a station

terminal for a station service, then we will make an order to that effect; and an inquiry must be held as to what is the amount of the proportion of that charge.

Mr. BALFOUR BROWNE: If the Court really made such an order, it seems to me that the Corporation and the Railway Company could probably put their heads together and come to some understanding. If your Lordship decides the question of principle, I think possibly that might be done. My learned friends have, if I may say so, properly said here "There is a carting terminal in these rates for general traffic that shall come off."

Justice LAWRENCE: With regard to which traffic?

Mr. BALFOUR BROWNE: The general traffic. I am still going to rely upon certain cases which show that, whether there is a terminal charge in it or not, we may still be entitled to a rebate or allowance.

Sir ALFRED CRIPPS: Then the apportionment of the figures into whatever it might be would be a subsequent matter. Let us take it that your Lordship will decide on the point of principle first; and if that is so, I do not know that we could assist the Court further as regards the Midland case. We have to show the nature of the services we perform in connection with the present sidings.

Mr. BALFOUR BROWNE: One matter that will have to be determined as a matter of principle is whether as a fact services are rendered to us for which they can make some charge.

Justice LAWRENCE: We have to determine that, as I gather, because they have in this case divided the rate, and said there is 1d., or some such sum, in respect of those services. Therefore you are entitled to say, I think, upon that: "That is their own admission; and consequently unless you are satisfied there is some service performed, there must be something to come off."

Sir ALFRED CRIPPS: Taking the Midland case, where we have admitted, or at any rate stated, that a part of our charge is in respect of services in connection with the station terminal, and is not included in the conveyance rate, it seems to be incumbent upon us to show that we have performed a class of duty or service which entitles us to make a charge under that head.

LONDON AND NORTH-WESTERN RAILWAY CASE.

Mr. *Thomas Mitchelhill*, Mineral Traffic Manager of the London and North-Western Railway Company, in answer to Sir ALFRED CRIPPS, said, with reference to the inward traffic to Nechells (other than coal, as to which no question was raised), that the way in which the traffic had to be worked in connection with the sidings involved more work upon the main line than was necessary. It was, however, essential to work as they did, having regard to the position and the traffic which went on at the Nechells sidings. The outward traffic was taken away in a mixed condition—perhaps half-a-dozen empty coal-waggons, then perhaps some coke, and so on. The Corporation placed the train on the siding; and the Company's engine drew it out in this condition, and took it straight away into Windsor Street Station, a distance of 1¼ miles.

Sir ALFRED CRIPPS: For that 1¼ miles round to Windsor Street Station, you do not seek to make a conveyance rate; but you make a charge in respect of services in connection with the siding?

Witness: Nothing is charged for conveyance between here and Windsor Street; and I might say that in fixing the rates for this traffic, we based them on the Windsor Street distances—that is to say, the rates are alike.

Sixth Day.—Monday, March 29.

Mr. *Mitchelhill* was recalled on behalf of the London and North-Western Railway Company, and further examined by Mr. SIMON. He said that, in view of the way in which the outward traffic was presented to them at Nechells, it was impossible for the goods engine to take it and carry it on the journey towards its destination without great rearrangement. As the lines just outside the works had heavy traffic on them, it was impossible to do the marshalling there. Windsor Street was the nearest place it could be taken to for the purpose. They would be quite content to take the traffic straight away if it could be done; but he thought there would be a difficulty in the Corporation putting down any more sidings. Then there was the further difficulty that these sidings were on a falling gradient towards the gas-works. There was also an awkward curve there. From the point of view of arrangement before the conveyance could start, the same general conditions obtained at Windsor Street as at Nechells.

Mr. SIMON: As the Court know, the London and North-Western Company claim that 1d. is in the rate for these services at or in connection with the sidings. I am not going into the quantum; but I want just to ask you this: Supposing that these services which you have to render at or in connection with your sidings were rendered unnecessary through the Corporation presenting you the traffic in reasonable order, would you be very glad to give up your 1d.?

Witness: Yes. I do not think we make any profit out of the 1d.

Examination continued: As to the miscellaneous traffic inwards, with but one or two exceptions the rates were within the powers for conveyance and terminal, without allocating any terminal to the receiving end. There were two slight exceptions. The first was Manchester paint in casks, 21s. 10d. per ton, carted and delivered. After taking off the cartage allowance at both ends, this rate seemed to be unjustifiable with the other terminals at the starting end, to the extent of 1s. 3¼d.—that was to say, 1s. 3¼d. must really be placed against Windsor Street to justify the rate after allowance for cartage. Now the attention of the Company had been called to the matter, it had been looked into. The total amount of traffic that had passed under this rate in three years was, as far as could be traced, 4½ tons. Then there was Oldham, iron borings at 8s. 3d. There was here a small excess. So far as he knew, the only traffic ever passed at this rate was 4 tons in 1906. The cartage and delivery charge could be adjusted by the parties.

Justice LAWRENCE: What is there we have to deal with then?

Mr. BALFOUR BROWNE: I say that in each of these there is a terminal at the Windsor Street end. In that case, if there is a terminal, I shall claim that, as no service is performed for us, they cannot charge us that terminal. There has never been any request to the Railway Company to disintegrate these rates.

Mr. SIMON: Except in two cases, the rates are not above our maximum, even if we include any kind of terminal at the receiving end. The moment we are asked to disintegrate, we should, of course, say: "There is no charge there at your end at all. We can justify this by conveyance, together with terminal at the other end." As long as we may be treated as being in the same position as though we had been asked to disintegrate, and as though we had replied, "Every one of these rates is justified by being built up in this way, with the result that there is no charge at the Windsor Street end," I am content.

Mr. BALFOUR BROWNE: Except in those two instances, I think I may treat you in that way—as if you had said there is no charge.

Sir JAMES WOODHOUSE: You are going to ask us to infer there is a terminal?

Mr. BALFOUR BROWNE: I am going to ask you to infer that in each of these rates there is a terminal.

Cross-examined by Mr. BALFOUR BROWNE: Oxide of iron would be carried in the same way as a truck of coal. On coal a reduction of 6d. was given, so as to make a fair rate in competition with the Midland Company. He had no information as to the rate that was charged for oxide. Lime would be dealt with in exactly the same way; and the lime rates were much below the maximum for conveyance. A full train-load of coal was 38 trucks; and he had seen this number on the siding. He had not meant to say that working the coal in threw more work on the main line than was necessary. He had intended to say that the operation of dealing with inwards traffic which caused the Company to leave waggons on the main line so as to get round them interfered with working on the main line.

Mr. BALFOUR BROWNE: Do you agree that a railway company could not carry on the business of a carrier if there was no place to shunt or to stand and deposit their trucks in; and they cannot therefore be said to perform a special service by having or using or granting the use of such a place?

Witness: Of course, I am bound to say that to conduct their business railway companies must have shunting and marshalling sidings.

As a fact, you have your shunting and marshalling sidings for this traffic for Nechells at Windsor Street?—I repeat again that we should not require to take the waggons to Windsor Street if they were handed to us in the order in which the train could pick them up.

Mr. SIMON (in re-examination): It is rather suggested that the work which you do at such a place as Windsor Street Station siding is of the true marshalling kind which would be included in the conveyance charge. Do you distinguish between marshalling and sorting?

Witness: There is a distinction. Sorting is taking the waggons in the rough condition in which they are handed to the Company, and then dividing them out on to different sidings. Then when they have been placed in the sidings they are still to a certain extent in a rough condition for the train to take them away. The train proceeds with them; and on its way it may come across other sidings where the waggons have to be marshalled with other waggons which have come from other places.

It is one thing to divide waggons up for different trains, and another to arrange the waggons in a train in proper order. Does this rough sorting you have described as having to be done because of the inadequacy of the accommodation on the Corporation sidings at all dispense with the use of the true marshalling sidings up the line?—No.

Of course, the marshalling *en route* nobody suggests the Railway Company are going to charge for, except as part of the conveyance. If traffic is going to Windsor Street Station or coming from it, and you have to do the work that has been mentioned, is there included in your rates a charge for performing it on these sidings?—The Company are entitled to make a charge for it.

Is that the same kind of sorting work which you do for the Corporation traffic, even though it does not come from the station? Apart altogether from any question of the marshalling in marshalling sidings, do the waggons need sorting out?—Yes.

Justice LAWRENCE: I think we understand the difference. It is easier to understand than to express.

Mr. *W. Alban Jepson*, Assistant Goods Manager to the London and North-Western Company, in answer to Mr. SIMON, said that up to the end of last year he occupied the position now filled by Mr. Mitchelhill. With regard to the coal rates to the Windsor Street siding and the Nechells siding of the Corporation, they were in both cases lower than the station rates. There was no such thing as a rebate. In the case of the Windsor Street works, the charge was 3d. less than at Windsor Street Station; and the Nechells charge would be the same, were it not for the competitive rate which had been fixed to come into line with the Midland Company. In any event, "rebate" was an altogether wrong term to use. In the mind of every railway man there was a distinction between sorting such as could be done on the private trader's sidings, if he had adequate accommodation, and marshalling trucks, such as was carried out on marshalling sidings. To be absolutely free from any charge for terminal services, it ought to be possible for the train going in a particular direction to back into a siding and pick up the waggon for that particular direction. If any sorting had to be done to enable this picking up to be carried out, this would be, in his view, a subject for a charge. Getting the Corporation traffic in order, as they had to do, was quite outside conveyance. It was in respect of this sorting—coupled with clerk work, provision of sidings, &c.—that the Company claimed to make the charge at or in connection with these sidings. If the Corporation tendered the traffic sorted so that it could be hooked on to a train, the Company would be perfectly willing to forego the 1d. charge. In fact, they would save money by it.

In cross-examination by Mr. M'CARDIE, witness was pressed to say whether there was a terminal charge included in coal delivered to Windsor Street Goods Station; but he declined to give a general answer to the question. He said, however, that in local coal traffic there probably would be some element of station terminal; but for the long distance coal and coke traffic such as they were dealing with in this case, the rate was very much more than covered by the conveyance

alone. He admitted that on Jan. 20, 1906, Mr. John Rawson, the Midland Company's Manager, telegraphed him: "Nechells Gas-Works. Do you not include something for terminal the same as Windsor Street, where powers given by you include 2d.?" His reply, on Jan. 25, was as follows: "Of course, you will understand that in setting down 2d. per ton as the terminal at Windsor Street, this was a very rough and ready calculation; and I should not like it to be used in any information which is proposed to be given to the Birmingham Corporation, as we might find a difficulty in supporting it. I do not think we have ever had to use the argument of a 2d. terminal at Windsor Street. In maintaining the present rates, and having regard to the large quantity of traffic dealt with there, I am inclined to think that both at this and the Nechells Gas-Works the usual practice of adding 1d. for services at private sidings would be quite sufficient. I should like to have a copy of any information you may be giving to the Corporation as regards coal rates to either Nechells or Windsor Street."

Mr. M'CARDIE: When did you come to the conclusion that there was no terminal included in these rates?

Witness: I say now that there was no terminal included in the rates to the Windsor Street Corporation gas-works sidings, because they are more than covered by conveyance.

Mr. ASPINALL objected to the case of coal being gone into, as it was not, in regard to this Company, before the Court.

Justice LAWRENCE said he did not see how it was relevant.

THE GREAT WESTERN RAILWAY CASE.

Mr. *Thomas H. Rendell*, Chief Goods Manager of the Great Western Railway Company, examined by Mr. RUSSELL, said the case against his Company fell under three heads—the inward coal traffic, the outward coke traffic, and the rate for bricks and retort material from Corngreave sidings which was in excess of their powers. The way in which the traffic was now worked at Swan Village was the only method in which it could be safely done. The sidings at Swan Village Goods Station, on which ordinary (not gas) coal traffic was dealt with, were opened in 1900; and then the same figures were put in force as were in operation at the gas-works. The private siding rates were the older ones; and the general station rates were made to conform with them. When the station rates were fixed, no specific sum was included for terminal. The rates were less than the maximum charge for conveyance; and no question of terminal would therefore arise. The rates from most of the collieries were only 66 per cent. of the maximum powers; and the highest charge in a table he submitted was no more than 77 per cent. The existing coke rates were put in force about 1893; and the filing of the application was the first intimation he had of any complaint in regard to them. When their attention was called to any charges which might be thought high, careful consideration was always given to the matter, and reductions were made, if thought fair. The empty trucks and the waggons of coke were put by the Corporation in the outwards sidings mixed up together. The coke traffic was very small; the average being about 4 trucks a day. The difference between the rates complained of and the amended rates for the six years prior to the application, which the Company were willing to refund, amounted to £67, or £11 a year. The outward traffic was taken to West Bromwich, where it was put on sidings and sorted and marshalled. For this use of West Bromwich Station, and the shunting and marshalling, the Company claimed to charge 1d. on coke. That was to say, the amended coke rates were made up of the maximum conveyance powers, *plus* 1d. Though the distance from Swan Village to West Bromwich was over a mile, the conveyance charge was calculated from a point exactly opposite the gas-works siding junction. The rate of 3s. 2d. for bricks and material from the Corngreave sidings, which had been reduced to 2s. 6d., was now based on the shortest physical distance. It did not include any charge for additional mileage. The traffic arose in connection with Messrs. Mobberley and Bayley's private siding. Owing to Cradley Heath Station being very much overcrowded, it was necessary to work this traffic down to Stourbridge and bring it back again. The former rate of 3s. 2d. was based upon the additional distance over the direct mileage.

Cross-examined by Mr. BALFOUR BROWNE: Formerly when the larger rate of 3s. 2d. was charged, 1d. was allocated to services at Messrs. Mobberley and Bayley's sidings. Since, however, attention had been called to the matter by these proceedings, it had been found that the work they had to do at these sidings was very onerous; and he had therefore, in the 2s. 6d. rate, added 2d.

Mr. BALFOUR BROWNE: This new invention of 2d. is not in your rate-book; and therefore it cannot justify your 2s. 6d.

Re-examined by Sir ALFRED CRIPPS: Though he was only claiming to make a charge of 2d. in connection with the Corngreave sidings rate, a week's observation showed that the cost per ton of goods of the Company's services at Messrs. Mobberley and Bayley's siding really came out at 3·9d.

Mr. Simon's Address for the Railway Companies.

Mr. SIMON, in addressing the Court on behalf of the Railway Companies, said that, in summing up the case, he wished to refer to the several propositions for which they contended. If a company were charging above their maximum power, there was, of course, nothing to discuss. All that remained was for the charge to be reduced. If, however, it was found that the Companies were within their maximum powers, there was really no inference to be drawn from the circumstance that the rate happened to be the same from or to a siding as it was from or to a station. The confusion that arose here was, he ventured to think, that when one was dealing with a case of undue preference, it was the essence of the matter that there should be competition. Here there was no element of this sort; but it was only in this way that an inference would really arise from the fact that there was inequality in point of total between a station rate and a siding rate. The rates which were charged by a railway company in England were not arrived at by the application of some cast-iron formula to distance. They were not part of a systematic, mathematic whole, which could be worked out *a priori* if one only knew the termini. They were, as a matter of fact, in every case such rates as a company thought it right and reasonable to charge within their maximum, having regard to the amount of the traffic, the competition with other companies, &c. Therefore there was really no inference at all to be drawn. The next proposition for which they contended was that even supposing such an inference had a foundation or could be supposed to arise as a *primâ facie* inference, it was rebutted as soon as it was shown that the Railway Company were, in fact, rendering services which were not within their conveyance charge. For this purpose, it was always to be remembered that there were two clauses in the Order which were correlative; and they could only fairly construe one by having regard to the other. One was clause 2, and the other clause 5. Clause 2 read: "The maximum rate for conveyance . . . . includes provision of locomotive power and trucks by the Company and every other expense incidental to such conveyance not hereinafter provided for." In order to apply this clause fairly, one had to look to see what was "hereinafter provided for." It was only with clause 2 in mind that one could put the true interpretation upon clause 5, which spoke of the Company's right to charge for services hereunder mentioned or any of them when rendered to a trader at his request or for his convenience. Unless one read the two together, the real difference was not quite so apparent. The fundamental distinction was between the expense which was incidental to conveyance on the one hand, and a service or expense which was not incidental to the conveyance, but which was incidental to delivery and to reception, on the other. The odd thing was that this class of case was put forward by the applicants as though they were entitled to say: "I stand upon conveyance, and nothing but conveyance, the moment I show there is no station involved." This was not so at all. Traffic had to be received and delivered, whether there was a station or not; and in every single case, whether it was a station or whether it was a siding, they would always have these three elements appearing in order: First, the service of receiving; secondly, the service of conveying; and, thirdly, the service of delivery.

Justice LAWRENCE: Under which of these do you say it is? No. 5 is an authorizing section for services hereunder mentioned. Then you have to get it within one of the sub-headings in section 5, so as to be a service for which you are authorized to charge.

Mr. SIMON said the one under which they submitted they came was sub-section 1: "Services by the Company at or in connection with sidings not belonging to the Company." They had it on the face of the Order that Parliament did not contemplate that the expenses incidental to such conveyance, and the payment made for such expenses, which was the rate for conveyance, was going to include this at all. It was contemplated that these two things were correlative and contrasted. The next point was that they were not concerned there at all with the question of amount. All that they were now endeavouring to do was to show that there were services which were of the character mentioned in clause 5, sub-section 1, which the Companies rendered. Once they showed this, inasmuch as all the rate they sought to justify was comfortably within the maximum, the whole thing was over; and any inference from the equality of total entirely disappeared as soon as it was shown that there were services rendered which did come within this sub-section. It was suggested, he thought wrongly, that the Act of 1894 in some way which it was exceedingly difficult to grasp, conferred upon the applicants the right to come there to ask for a rebate or allowance, even without going to the length of establishing to the satisfaction of the Court that in the rate now charged to them there was a charge for station services or accommodation. He submitted that this was quite wrong. Section 4 of the Act was based upon the idea that there was to be a reasonable charge made; and that once it was shown that the charge in fact included something in respect of station services, this gave no right to ask for rebate. Until the time came when one could subtract something out of a total in which it was not at all, it was inconceivable that the Legislature should have intended section 4 to allow an applicant to come and claim a rebate or allowance, because he did not get any station services, though he had not succeeded in proving that there was any such charge for station services included in the charge made to them. Mr. Balfour Browne was, he presumed, going to argue that there was no difference between the sorting of trucks and the marshalling of trains—which latter was undoubtedly part of the conveyance.

Justice LAWRENCE: Mr. Balfour Browne says they are substantially identical—that, it seems to me, is the way he has been suggesting it by cross-examination.

Mr. SIMON: May I make this observation upon it? It may or may not be that somebody some day may hold that the two things alike fall upon the railway company to pay for; but nobody who appreciates what the transactions involve will say they are substantially identical in character. One is sorting trucks, so that the right trucks can be tied on to the right train; and the other is sorting out your train, which is quite a distinct operation. They are as distinct as any two operations can be.

Sir JAMES WOODHOUSE: I do not quite follow. We have had an illustration given of fifteen trucks standing in the sidings of the Saltley works. One of your witnesses, I think it was, said that trains were made up on these sidings by putting all the traffic going in a particular direction on one train, all that going in another direction on another, all that for the North-Western on another, and so forth. Is that what I understand you mean by sorting—that is to say, all the trucks for a particular district?

Mr. SIMON: No, not quite that. You will forgive me if I do not deal with that particular illustration.

Sir JAMES WOODHOUSE: It was a practical one that came before us in the course of the evidence.

Mr. SIMON: I do not deal with it for this reason, which is also a practical one—that, not appearing for the Midland Railway Company, I do not profess to have followed the evidence about the Midland Company's case. What a railway company are entitled to say, as I understand it, to a siding owner, is this: "I am quite prepared to come to your siding, hook your waggons on to my train, and then my train shall proceed. I quite admit that it may be necessary at some subsequent stage to break up my train, because there will be junctions, and other things of that sort." What a railway company are not obliged to do without being remunerated is quite a different thing. It is sorting out which of the trucks go one way, and which another. It cannot be that when a railway company run, as we know they do, goods trains

according to a definite time-table, they have got to take the waggons, some of which are going north and some south, and do the sorting of the waggons themselves.

Sir JAMES WOODHOUSE: What do you say is marshalling?

Mr. SIMON: I say it is a distinct operation—a different part of the journey. It is during the journey; and the journey is conveyance. Suppose you have a series of waggons not in their proper order in a train, and the train is going past three or four stations. You would come to some junctions where you are to get other waggons also going to that destination. I perfectly agree that breaking up the train, and possibly making it into two, at such a place as that, is an operation in the course of conveyance. No one disputes that; but this has nothing to do with the operation of seeing that the waggons are given to the railway company in such order that the train which passes is at any rate taking them the right way.

Justice LAWRENCE: Mr. Balfour Browne's favourite illustration is to take a single truck. He says: "I am entitled as a freighter to give a single truck, am I not; and you are bound to take it away, and take it when we like?"

Mr. SIMON: He is not entitled to stop all my up goods trains, and insist upon my taking a single truck destined for the down-line. That is the effect of what happens at Nechells and Windsor Street. He throws his traffic at us without regard to where it is going; and I submit we have conclusively shown that it is given to us in such a state that we have to take the thing all away without consideration of where it is ultimately going—to take it somewhere else, proceed to pick it out, and do that very operation which, if his sidings were decent, would be done before it was ever given to us at all.

Mr. BALFOUR BROWNE: Not upon our sidings. How could we sort it out?

Mr. SIMON: I submit that a railway company are entitled to have tendered to them at the siding a waggon or series of waggons, I do not care which, in a condition to become part of one of their trains. Our submission is that it cannot be, merely because the Corporation do not happen to have room to put their trucks in order for us to take, that therefore the simple fact of throwing them on to our main line disentitles us at any rate to payment at all for what we do in order to put them into a condition to go on.

Justice LAWRENCE: If you follow out Mr. Balfour Browne's illustration, it seems to me to be this: We are giving you the traffic which involves your sending an engine down to every truck and taking it off—first one, then another. If every freighter did that, no railway work would be possible.

Mr. SIMON: So far from there being a rebate because there is a siding, the Legislature in such facts would have to provide that there should be a charge where there was a siding.

Mr. GATHORNE-HARDY: I understand you to say that sorting as distinct from marshalling means this: We had an illustration of 38 trucks—15 for one place, and the others going in different directions. You say you were entitled to have those 15 waggons all together.

Mr. SIMON: Yes. They are not content with giving us one at a time—that would be, as a matter of fact, unreasonable and outrageous, considering the amount of their traffic—but they insist on my having one which has tied on to the tail of it a lot of others which are not going to the same place at all, and then another one coming at the tail of that. If they do not choose to get on their own ground sufficient space to put the thing in order, it is contrary to the whole law of railways, as I understand it, to say that we, as part of our conveyance, have to do that. It cannot be part of conveyance to say: "Here are six trucks going to five different places; the first and the sixth are going to one place, and the intermediate ones somewhere else." The least I am entitled to do is to say, if we have to stop trains, as we have, and go back over points and into a siding, as we have, our duty, and our whole duty, there is to hook on. Supposing they had sufficient accommodation for this sorting process, but they said to the Railway Company, "Instead of our sorting it, you come and sort it for yourselves," and we sent a railway engine down to their works, and sorted their waggons into order to hook on to our trains, does anybody mean to say we should not be entitled to be paid for that? Yet the operation is exactly the same operation in nature as we now do for them on our main line. It is obvious that if we were asked by them to come on to their own sidings, which were adequate for the purpose, and do the sorting, this would be a work which would be rendered at their sidings. We admit it is not rendered at their sidings here; but it is rendered in connection with these sidings, and, as long as the service is in the essential features of it the same, I submit it cannot matter that it is rendered on our line, and not theirs. These are the propositions for which we contend; and in these circumstances, I submit that the applicants really do not make out the foundation of any case, and they do not make the point good, that in that which we seek to charge them we are charging them anything at all for station services or accommodation.

The Court then adjourned.

Reduction in Price at Dukinfield.—The Dukinfield Gas Committee have decided to reduce the price of gas to ordinary consumers from 2s. 9d. to 2s. 6d. per 1000 cubic feet. The profit upon the gas-works during the past year amounted to nearly £900.

South Barracas (Buenos Ayres) Gas Company, Limited.—At the ordinary general meeting of the Company held on the 22nd ult., the Directors reported that the profits for the past year amounted to £11,050, which was brought up to £11,404 by the addition of the sum carried forward. They recommended a dividend at the rate of 5 per cent. per annum, free of tax, which would leave a balance of £3904. In moving the adoption of the report, the Chairman (Mr. J. C. im Thurn) stated that during the past year the works had been maintained in a thoroughly efficient condition, and no pains had been spared to enable them to cope with the increased business. The progress of the Company had been most marked. There had been an increase of 595 consumers during the year, and the consumption was growing steadily at a most gratifying rate. The districts served were developing in a remarkable manner, and land values continued to go up. There was also a steady increase in the number of the public lamps. The report was adopted unanimously.

BIRMINGHAM CORPORATION GAS DEPARTMENT.

Annual Report and Accounts.

At a Special Meeting of the Birmingham City Council next Tuesday, the Gas Committee will present their report, together with the accounts of the department for the year ended March 31 last.

Among the contracts for new buildings and plant entered into since their last report are two which have been made with Messrs. Gibbons Bros., Limited, in connection with the reconstruction of a retort-house and the erection of a boiler-house chimney at the Adderley Street works. These contracts, the Committee point out, were occasioned by the necessity for reconstructing No. 2 retort-house owing to its dilapidated condition. The house was erected prior to the acquisition of the undertaking, and had a productive capacity of 900,000 cubic feet of gas per diem. The new retort-house, when completed, will be capable of producing 1,750,000 cubic feet per diem, and is to be fitted with horizontal retorts heated by regenerative furnaces, to be charged and drawn at the one operation by a Fiddes-Aldridge machine. Messrs. Gibbons Bros. were selected to undertake the work, owing to the experience they had gained in erecting similar plants at both Liverpool and Wrexham.

The distribution of gas to the outlying districts of the area of supply, where considerable building operations are in progress, has engaged the attention of the Committee. The practice in the past in such cases has been to lay down larger trunk mains from the works to the areas requiring an augmented supply; but the Committee have arranged, in accordance with modern practice, to lay down a trunk main that will be worked at a pressure of about 2 lbs. to the square inch, with off-takes at various points, where the pressure, regulated by governors, will be reduced so as to maintain the supply at the normal or required pressure to the premises of consumers. In laying down this system, the route of the main will be arranged so as to supply gas at high pressure for public lighting along the chief streets in the centre of the city. It is proposed, in the first instance, to lay mains from the Windsor Street works along Lord Street, Dartmouth Street, Lister Street, Aston Street, Corporation Street, New Street, and Paradise Street, with branches along High Street, Martineau Street, Bull Street, Stephenson Place, and Worcester Street, to the Market Hall. The plant for compressing the gas will be installed at the Windsor Street works; and the estimated cost of the scheme is £15,000.

As the result of a conference convened by the Lord Mayor, the Committee have arranged with the Electric Supply Committee that a small Standing Committee of Reference, consisting of the Lord Mayor and three members of each Committee, shall be constituted to deal with any differences that may possibly arise from time to time in the conduct of the two undertakings. Subject to the exceptions specially authorized by the Council, neither Committee is to make any charge which is not in accordance with the rates already approved by the Council; and in the special cases the proposals are to be submitted to the Standing Committee before the bargain is concluded.

The Committee have been invited to quote a price for a large and regular supply of gas, to be taken under conditions that are exceptionally favourable to the gas undertaking, and that justify special terms being given. The Committee recommend that, subject to the approval of the Standing Committee already mentioned, they be authorized to make terms—the charge for gas to be such as will be applicable to all consumers whose conditions of supply are similar.

It is recalled that on May 28, 1908, a report was presented by the Committee which announced the retirement, on superannuation, of Mr. Henry Hack, the Engineer-in-Chief; and the sanction of the Council was asked to a scheme, as a trial, whereby the Engineers of the Saltley, Nechells, Windsor Street, and Swan Village works, having qualified for more responsible positions, should be appointed Engineers-in-Charge of their respective works. In presenting the report, the Chairman indicated that, should the trial prove successful, the Committee would bring a definite scheme before the Council at a later date. The duties and responsibilities of the Engineers-in-Charge were carefully reviewed and extended by the Committee; and weekly conferences of the chief officials, including the Chief Chemist, were arranged as a means of ensuring concerted action in matters relating to the manufacture and distribution of gas, and of full consideration being given to all proposals for the improvement or extension of plant. The organization thus formed twelve months ago has worked so smoothly and well that the Committee are unanimous in their opinion that its continuance is in the best interests of the undertaking. It is rendered valuable by the blending of the commercial with the manufacturing forces of the department; and the Corporation are safeguarded on the engineering side under this scheme by the retention and active co-operation of several trained and experienced Engineers.

To secure continuity of policy, the Committee believe the arrangements for the future should be framed so as to indicate reasonable prospects and fair remuneration to the chief officials of the department so long as they discharge their duties with efficiency; and to this end they recommend that the maximum salary to be paid to each of the Engineers-in-Charge of the three large works of the undertaking—Saltley, Nechells, and Windsor Street—shall be fixed at £1000 per annum. The magnitude of the works in question will be appreciated when it is stated that, collectively, they use nearly 500,000 tons of coal and 2,500,000 gallons of oil in the production of 6,500,000,000 cubic feet of gas per annum. The Swan Village works have a productive capacity of only about one-third that of any of the other works named; and the salary of the Engineer-in-Charge of these works can be dealt with by the Committee in the ordinary way. It is, however, intended by the Committee that the increases of salary to Engineers-in-Charge shall, as from this date, be as follows: Mr. John Foster (Windsor Street), from £650 to £700 per annum; Mr. W. Chaney (Nechells), from £625 to £700; Mr. F. J. Bywater (Saltley), from £425 to £600. Thereafter the Committee purpose advancing these salaries from time to time, and within the maximum named, to such an extent as the service of the respective Engineers appear to the Committee to warrant.

With regard to the office of Secretary, the report continues, "from the discussion which took place in the Council in May, 1907, it was

apparent that the title of Secretary created an altogether wrong impression of the duties performed by that officer; and the Committee therefore recommend that he be appointed from date as Secretary and Manager of the undertaking. The reason for this will be apparent to the Council when it is pointed out that the office in question is one of great and increasing responsibility. The holder of the position is the Chief Executive Officer of the department, who not merely performs ordinary secretarial duties, but advises the Committee on questions of policy, negotiates the purchase and sale of materials aggregating in value considerably over £500,000 per annum, supervises manufacturing costs and all other charges, and is responsible for the organization and efficiency of the large staff necessary for the conduct of the business. The Committee unanimously recommend that the maximum salary for this position be fixed at £2000 per annum. The present Secretary, Mr. G. Hampton Barber, commenced his duties with the department in February, 1901; and during the intervening eight years the Committee have had the fullest opportunity of proving his business knowledge, powers of organization, devotion to duty, and capacity for work. The outcome of his labours is fully shown in the development of the undertaking and the financial results that have been achieved during his term of office. His salary at present is £1400 per annum, which the Committee now propose to increase to £1600; any further advances within the above maximum to depend upon his continued efficiency and the prosperity of the undertaking."

The increases now recommended will bring the total salaries paid to the Secretary, Engineers, Engineers-in-Charge, and Works Superintendents up to £5240 a year, or £160 less than was paid in 1901; while the quantity of gas sold has increased from 5700 million cubic feet to 7000 millions. In conclusion, the Committee say they are convinced that the organization outlined "is necessary for the complete administration of this, the largest commercial department of the Corporation, and the largest gas undertaking in the Provinces."

The work of the undertaking during the past twelve months is indicated by the following figures, which are included in the report.

Statistics for the Years ended March 31, 1908 and 1909.

—	1908.	1909.	Increase.	Decrease.
Gas sold during the year (cubic feet)	7,042,025,400	6,977,793,200	—	64,232,200 = 0·91 per cent.
New services laid during the year	7,518	8,117	599	—
Cooking and heating stoves sold during the year	703	643	—	60
Total number of cookers supplied to prepayment consumers at March 31	40,945	48,444	7,499	—
Total number of cooking and heating stoves on hire at March 31	5,041	7,351	2,310	—
Total number of prepayment meters fixed at March 31	55,782	62,431	6,649	—

The accounts show that the receipts from the sale of gas amounted to £698,712, as compared with £720,323 in the preceding year; while residual products realized £228,082, against £250,656. The total receipts were £935,636, as compared with £980,083. On the other side of the revenue account, under manufacture, coal (including oil, carriage, unloading, and all other expenses of depositing same on the works) cost £369,642, against £398,333 in the preceding year; purifying materials and wages, £6824, against £16,238; wages at works, £78,253, against £80,385; and repairs, maintenance, and renewal of works, plant, retorts, machines, apparatus, and tools (less old materials sold), £157,091, against £168,654. The total cost of distribution was £57,733, as compared with £62,020; and the remaining items brought the expenditure up to £745,335, against £800,126 in 1908. There was thus on the present occasion a balance of £190,301 to be carried to the profit and loss account, compared with £179,963 in the previous year. After meeting interest and other charges, there is a net balance of £71,459, which compares with £61,313 last year.

The quantity of coal carbonized in the past twelve months was 571,975 tons, and of gas oil used 2,578,910 gallons. Of gas sold and used on works, the amount was 6,977,793,200 cubic feet. The average net price of gas was 2s. 0·03d. per 1000 cubic feet. Coke and breeze realized £142,552; tar, £33,074; and ammoniacal liquor, £52,217. The estimated quantities made were: Coke, 309,030 tons; breeze, 59,536 tons; tar, 6,632,301 gallons; and ammoniacal liquor, 22,448,833 gallons. Of coke, 222,390 tons were sold, and 86,496 tons used.

The contributions of the Gas Department for public purposes during the year were—

In aid of the improvement rate	£71,459
Ditto interest on reserve fund	4,000
In aid of public lighting within the city	8,967
In aid of court lighting within the city	2,133
In aid of public and court lighting outside the city	4,331
Total	£90,890

New Joint-Stock Companies.—Under the title of Water and Gas Securities, Limited, a private Company has been formed with a capital of £1000, in £1 shares, of which 500 are preference. Water Undertakings, Limited, was registered on the 26th ult. with a capital of £1500, in £10 shares. The Leeds Meter Company, Limited, has been formed with a capital of £3000, in £5 shares, to adopt an agreement with C. Meinecke and R. Cremer for the acquisition of the business carried on at No. 37, York Place, Leeds.

PRIMITIVA GAS COMPANY, LIMITED.

The Amalgamation of the Three Buenos Ayres Companies.

The Annual General Meeting of the Company was held last Friday, at the London Offices, No. 153, Leadenhall Street, E.C.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. J. H. Bouwer) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN moved the first resolution, adopting the report and accounts, and declaring a final dividend of 4s. 6d. per share, free of income-tax, making a total distribution on the ordinary shares of 7 per cent. for the year. In doing this, he said it would be of no use for him, under the circumstances in which they were meeting, to delay, by going through the details and the items of the accounts, from discussing the point which, after the meeting of the River Plate Gas Company the other day, would no doubt be the most pressing one on the minds of the shareholders. His contemporary (Mr. Bowen) of the River Plate Company gave his shareholders some information, which he (the Chairman) noticed was followed soon after by a movement in the Stock Exchange, showing that the public and the shareholders had appreciated the new position which he described as having arisen. It would be remembered that, at the meeting a year ago, he (the Chairman) told the shareholders the Board were being driven as far as they could be by the Municipality, who had driven very hard terms with the Tramway Company a little while before, and who were seeking to impose upon the Gas Companies conditions which would be very onerous and very difficult to comply with. He also explained that the position of the Company in Buenos Ayres was not exactly that of having a definite concession like gas companies possessed on the Continent of Europe, nor anything like the powers of a gas company working in Great Britain, who had an Act of Parliament, the powers of which were revised and extended when the business required this to be done. The authorities in Buenos Ayres were well aware of this; and they had been putting pressure on the Gas Companies to make a substantial diminution in the price of gas. They made an ordenanza, which, fortunately, was afterwards withdrawn; and their demand to reduce the price of gas was limited to the modified reduction of 2 cents per cubic metre, which came into operation only during the last three months of the year, and to that extent had militated against the figures in the present balance-sheet. At last, he was bound to tell the shareholders, the authorities had come to clinches with them; and yet he could not say the agreement was in such a form that he could submit it to the shareholders that day, as it would be submitted, in the *ad referendum* form, seeing that it must receive their approval before it could be carried out. The matter was, in fact, not so far concluded that he could venture, with safety or propriety, to give the shareholders the particulars. It was, on the whole, a bargain which would relieve the Directors from the anxieties—the pressing anxieties—they had been under during the past year; and all three Companies had been treated the same, in regard to the possibility of considerable alterations in their future. The shareholders knew when one had been bearing pin-pricks a whole year—when one had been suffering duress for a year—the slightest cessation of it was something that gave one ease; and he would describe the position rather in that respect. But, on the whole, the Directors had been careful of the interests of the shareholders; and when the agreement came before them, it would be found that the Directors were presenting terms which, under certain circumstances, could be accepted as being a solution, and a fairly satisfactory solution, of the position. But he was bound to say another thing. They had heard him in that room advocate, and say how willing this Company would be to promote, the fusion of the three Companies, and which fusion would bring about certain economies. The operations of the past year had brought the three Companies together in a way in which they were not associated before. The Directors of the three Boards had been meeting constantly to discuss these points—loyally desiring not to move in any direction without the full support of each other. The other Companies, after the Directors had mixed together, had seen and recognized—the very hardship of the terms sought for by the Municipality had caused them all to see and recognize—in a manner not apparent before, the absolute necessity of the fusion of the Companies under one management. There was not the slightest doubt in any business man's mind that, if these Companies were to bear fresh burdens under the requirements made by the Municipality, they would do so much better, and at much less expense, joined together than they would separately. The terms therefore on which this new scheme would be best entered upon would necessarily involve the amalgamation of all the interests. He must say, however, that while the Directors had been negotiating, and they hoped to see a satisfactory solution as far as the three Companies on this side were concerned, the questions would be subject to an *ad referendum* discussion when shareholders were called together to agree to them. Beyond remarking that the Board hoped these long negotiations had reached a result which would not be unsatisfactory to the Companies which would be fused, that it would not be possible to carry out the demands made upon them without fusion, and that all recognized that fusion was desirable, he would leave the subject by asking the shareholders to refrain from putting questions to him which might complicate matters here and in Buenos Ayres. Having spoken on the question which he knew would be uppermost in the shareholders' minds, he would deal with the balance-sheet. The total at the credit of the profit and loss account was £120,246; the profit being something like £15,000 more than it was this time last year. The shareholders might wonder how this was arrived at. He would explain it presently. They had a balance forward from the previous year of £15,881, which was slightly less than it had been before, and which made a total of £136,128. Deducting interest paid on debentures (which was practically the same as before), and the interest and expenses in London (which were less than before)—£8703, against £9101—allowing for £40,000 for interim dividend on the preference shares and £10,000 on the ordinary shares, and placing to the general reserve account £10,000, which was some £4000 more than last year, they had the

balance of profit at the end of £44,903, against £33,881, or £11,000 to the good. Out of this the Directors recommended a final dividend of 4s. 6d. per ordinary share (free of income-tax), making 7 per cent. for the year. The net result was that £18,000 would be absorbed by this payment, and that £26,903 would remain to be carried forward, against £15,881 last year. Now this was extremely satisfactory. He might say that this larger income would not have been produced had it not been for the exertions of their Engineer (Mr. B. F. Browne) and their Local Director (Mr. Hale Pearson), who had been directing their attention very much to the question of extending the supply of gas for cooking and heating, and things of that sort. Meanwhile they had not been remiss in attending to the general condition of the concern. The make per ton had gone up considerably, and the leakage account had also been reduced to a satisfactory figure. There was a large increase in the number of cooking stoves on hire—something like 31½ per cent., which testified to the great exertions that had been put forward in this direction. There had been something like 12 miles of mains laid altogether during the year, of which 8¼ miles were absolutely in new directions, which meant added business. The number of services had increased by 11 per cent., or by 5421. The chemical works had been well looked after; and they showed a very satisfactory increase of profit. There had been spent on capital account £30,900, which was a small percentage of the previous capital, compared with the business he had shown had been done. There was a satisfactory reduction in the cost of coal into store of something like 1s. 4d. per ton; but this only corresponded with the fall in the price of coal generally in this country. Reverting to the negotiations forming the subject of the first part of his address, he might say that, while they had been of general anxiety to the Board, they had been an especial anxiety to Mr. Sanford, whose absence from the meeting he ought to explain. He had worn himself out; and he had gone away for a short time to recuperate. His work on behalf of the Company had been inestimable. His great financial knowledge, and his local knowledge of Buenos Ayres, had been of vast advantage. It had also been a great advantage to have such an able and influential representative on the spot as Mr. Hale Pearson, the Chairman of the Company's Local Committee; and his efforts ought to be recognized. There was one other point that ought to be mentioned. Both of the other Companies in their reports referred to the amount spent on the repair and upkeep of their works. He had gone through their own figures carefully, and found they had spent £33,000 for this purpose, which, in proportion to their sale, was at least as good as the other Companies—in fact, it was an amount that would do more than maintain the efficiency of the works in the highest condition. Their Engineer was a man who would not have his works in anything but the best possible state.

Mr. W. W. PHIPPS seconded the motion; and it was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. PHIPPS, Mr. Sanford was re-elected to his seat at the Board. In some further appreciative remarks of Mr. Sanford's services, the Chairman said that gentleman was the best qualified of the members of the Board to carry out the negotiations, because he knew the local spirit and mind of the Buenos Ayres people much better than he (the Chairman) could possibly do.

On the motion of Mr. A. S. BARTHROPP, seconded by Mr. R. LONG, the Auditors (Messrs. G. A. Touche and Co.) were re-appointed.

The CHAIRMAN proposed a vote of thanks to the Local Committee (especially Mr. Hale Pearson) and the Engineer and technical staff for the capital results they had produced. He said he should like to mention this, that, inasmuch as the Company were likely to amalgamate with the other Companies, it was important they should put their house in good order; and the exertions of their Engineer had been shown in getting the works into first-class condition, and in putting in labour-saving appliances, which he had made to work very successfully, as well as in extending the outdoor business—perhaps in a manner that a year or two before had not been done so well. All this entitled him to the highest praise. The Board telegraphed out that he should receive a special bonus; and he (the Chairman) believed Mr. Browne was so single-hearted that he distributed the bonus among his assistants in the most unselfish spirit. This incident showed what a high-minded gentleman they had on the spot.

Mr. PHIPPS seconded the motion; and it was heartily passed.

Moved by Mr. G. SPURLING, and seconded by Mr. W. SAMSON, a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN's acknowledgment terminated the proceedings.

LLANDRINDOD WELLS GAS COMPANY.

The Second Ordinary Meeting of this Company was held at the Offices, No. 17, Victoria Street, S.W., on Monday, the 26th ult.—Mr. CHARLES HUNT in the chair.

The SECRETARY (Mr. C. Holmes Hunt) read the notice convening the meeting and also the report of the Directors. They expressed their pleasure in announcing the practical completion of the works, and the commencement of the supply of gas on the 20th of April. About 140 applications for gas had been received, including many of the leading hotels. The Directors considered this a satisfactory start; and they said they had every confidence in the success of the Company. The capital expenditure to the 31st of December amounted to £4860, and there had since been expended a further sum of £1639; making a total of £6499.

The CHAIRMAN, in moving the adoption of the report, said the completion of the works had been delayed from various causes; but they were now making gas, and connecting consumers as fast as possible. They had opened a show-room in which were displayed lighting, heating, and cooking apparatus, and it was attracting considerable attention. The Directors felt satisfied that a good start had been made; and they looked forward to a steady increase in the demand for gas. Those shareholders who were not familiar with Llandrindod Wells could not do better than pay a visit to the place, for he was sure they would be highly pleased with its invigorating air and health-giving waters, not less than with its charming scenery. The Urban District Council had recently decided to add to the attractions of the place by building a recreation-room; and the Company might pride itself on having stepped in to supply a long-felt want in the shape of smokeless fuel.

Mr. SMITH seconded the motion; and it was carried unanimously.

A resolution authorizing the Directors to issue 150 further shares in the Company was also unanimously passed.

The retiring Director (Mr. C. E. Murray) and Auditor (Mr. G. H. Sawyer) having been re-elected, a vote of thanks was accorded to the Chairman and Directors, on the proposition of Mr. W. C. PARKINSON.

EDINBURGH AND LEITH GAS COMMISSIONERS.

Superannuation Scheme—Question as to Air in the Gas.

The Monthly Meeting of the Edinburgh and Leith Gas Commissioners was held on Monday of last week—Bailie BRYSON, of Leith, in the chair—at which, among other matters, the superannuation scheme was under consideration.

The CLERK (Mr. J. M'G. Jack) referred to a report by Mr. G. Lisle, C.A., of Edinburgh, the Actuary appointed by the Commissioners, upon the scheme of superannuation authorized by their Provisional Order. He read the report of a Sub-Committee, which stated that the Actuary certified that, in order to comply with the obligation laid on the Commissioners to put the scheme on a sound financial basis, they would require to make a special contribution at Whitsunday next of £67,830. At the request of the Sub-Committee in charge of the arrangements for giving effect to the provisions of the Order, Mr. Lisle had added a recommendation that, to save the charges that would be entailed by granting a mortgage for this amount, the Secretary for Scotland might be satisfied with an obligation by the Commissioners to contribute the sum of £2035 per annum, being 3 per cent. upon the capital amount. The Committee reminded the Commissioners that when it was resolved to institute the superannuation scheme, it was decided to do so on the lines of the Edinburgh Corporation superannuation scheme. The draft Order was framed accordingly. The Secretary for Scotland, however, insisted on the insertion of the new actuarial clause (commonly called the Caldwell clause); and the Committee had no option but to agree to it. The Committee were still of opinion that the scheme would ultimately be found to be commercially solvent without the special contribution; but it was essential that the contribution should be made, in order to comply with the requirement that the scheme should at its inception be put on a sound financial basis. It was possible that when the scheme was found to be solvent without the special contribution, the Commissioners might be held to be entitled to repayment of it. The annual contribution of £2035 represented practically ¼d. per 1000 cubic feet of gas made. The Committee desired to remind the Commissioners that the power given by the Order of 1902 to grant annual voluntary allowances, aggregating ¼d. per 1000 cubic feet of gas made, which was equivalent to £2000 per annum, was repealed as from Whitsunday next, although the Commissioners might continue thereafter the allowances granted to the then existing beneficiaries. All the allowances granted under the Order would accordingly cease in natural course.

Bailie INCHES, the Convener of the Finance and Law Committee, said the Sub-Committee were perfectly convinced that the scheme, as proposed by the Commissioners, was quite a solvent one, though actuarially it was not. The Commissioners could show that the contributions would more than pay all the claims against the fund; and at the end of ten years they would have a substantial amount over. Of course, if the fund were not paying at the end of ten years, they might have to increase the contributions.

The CHAIRMAN remarked that if the fund accumulated, the Commissioners would have to go to Parliament to get power for repayment of the special contribution.

Mr. J. H. L. PENNELL said it was due to the Gas Commissioners that it should be understood that the clauses adopted by them were exactly the ones which related to the Edinburgh Corporation scheme. He thought it was quite right that the Commissioners should have an opportunity of protesting or dissenting that there should be such arbitrary action on the part of the officials in the Scottish Office. It was right that the Commissioners should say that the clause over which this difficulty had arisen never was before them. The proceedings were hanging in London, and a deputation was sent up by the Commissioners; and he gathered from the members who were there that they even did not see the clause, although they were told that, in all likelihood, there was no prospect of the Bill being allowed to go through without it being inserted. He did not quite agree with Bailie Bryson, that it would be a simple matter to get back this large contribution.

After some further remarks, the report of the Sub-Committee was adopted unanimously.

There was on the *agenda* notice of motion by Mr. Pennell and Bailie Neill: "To remit to the Works Committee to report, with a view to its discontinuance, upon the practice of introducing compressed air into gas supplied by the Commissioners, with direction to the Committee to inquire and report as to whether the air is usually, if ever, intermingled with the gas while undergoing statutory official test by the Public Analyst."

Mr. PENNELL said that at the start the question arose as to how far the Commissioners would deem it desirable, before there was an inquiry, that the subject should be discussed. For his part, if there were likely to be prejudice to the Commissioners, or to anyone responsible to them, he had no wish to enter upon a discussion until there was an inquiry. He thought the whole object would be attained by sending the motion to the Committee; and there would be a full opportunity of discussing their report.

The CHAIRMAN asked if it had not been open to Mr. Pennell to have brought the matter before the Works Committee. He denied that anything of the kind existed.

The motion was eventually unanimously remitted to the Committee to consider.

MANCHESTER AND THE RATES.

Very reluctantly, the Gas Committee of the Manchester Corporation have acceded to the urgent appeal made to them by the Finance Committee, backed by the Lord Mayor, and increased the proposed contribution out of the profits of the department in aid of rates from £26,495 to £50,000. It has to be noted, however, that the resolution of the Gas Committee sets out plainly that this increased grant is made "in anticipation of profits." Other trading departments of the Corporation have revised their estimates, and the absolute advance in the City rate is now put down at 3·44d. in the pound, which is slightly less than the sum required for the Ship Canal. The economists endeavoured to get the Electricity Committee to increase their contribution this year but without effect, so the department will only hand over in relief of rates £12,000, which is the same amount as last year. During the last ten years the sum contributed from the Electricity Department in aid of rates has only totalled £35,516; while the Gas Department in the same period provided £554,383.

As will be seen from the following table, the city has drawn very heavily on the profits of the gas undertaking since the works were acquired by the Corporation 65 years ago. The appropriation of the profits of the department since 1844 have been as follows:—

Paid over to the Improvement Committee for improvement purposes, 1844 to 1887, inclusive.	£1,367,641
Paid over to Water-Works Committee (one moiety of profits from 1852-1861, inclusive)	166,265
Cost of street lighting from 1878 to 1891, inclusive, borne by the Gas Committee.	329,201
Paid into the City Fund, 1888 to 1908, inclusive . .	995,476
Total amount applied in lieu, or in aid, of city rates.	£2,858,583

At a traders' meeting held at the Memorial Hall last Wednesday, to protest against any advance in the rates, Mr. G. H. Clapham, Vice-President of the Retail Traders' Association, said, with reference to the trading departments of the Corporation, the taking of money from them now was only "robbing Peter to pay Paul." He added, "I think if these departments belonged to a limited liability company, or to a private firm, and were realized to-day, very few of us would like to give 7s. 6d. in the pound. The depreciation funds are totally inadequate; the renewals are not half what they should be; the time of repayment is enormously extended; and if we get the Tramways Committee to give us £15,000 more, which is roughly 1d. in the pound, it only means that in a few years we shall have to pay that ourselves. It is the same with the Gas and Markets Committees. If we get an increased contribution to-day, we get a decreased one to-morrow." Alderman Copeland, Chairman of the Finance Committee, has replied to Mr. Clapham. He says that the Tramways Department has good reserves for a good renewal account; and as to the Gas Department, the Chairman (Alderman Gibson) told him a week ago that it was never in such a sound condition as now.

COVENTRY CORPORATION GAS UNDERTAKING.

Suggested Pensions for Redundant Employees.

At the Meeting of the Coventry Corporation to-day, the Gas Committee will present the following report, containing suggestions for a scheme of pensions which they recommend should be established.

Your Committee beg to report that they have had under consideration the question of the steps to be taken in view of the approaching completion of the new gas-works at Foleshill, and the consequent discontinuance of gas manufacture at the old works. The new works, owing to better arrangements and equipment, will not require the employment of so large a staff of workmen; and it will accordingly be necessary to dispense with the services of a number of men employed at the old works. An endeavour has been made to lessen the hardship which this will entail by transferring as many men as possible to the new works; but there still remain a number whose services cannot be retained. Inasmuch as many of the men have been in the service of the department for a considerable number of years, and in some cases are now advanced in life, your Committee think that, though the Corporation are under no obligation in the matter, it will be equitable to make provision for these by granting them weekly pensions, of amounts proportionate to the periods for which they have served the department.

The scheme of payments which your Committee propose—subject to the consent of the Council—to adopt is the following: (1) For men who have served 25 years and upwards, 12s. per week; (2) for men who have served 20 years but less than 25 years, 10s. per week; (3) for men who have served 10 years but less than 20 years, 8s. per week. (Men under 45 years of age to be placed in the third class, notwithstanding that they have 20 years' service.)

The number of men who would come within the scope of this scheme would be as follows: At 12s. per week, seven men at ages ranging from 52 to 66; at 10s. per week, one man aged 46 (two other men, aged respectively 44 and 41, being placed in the third class); and at 8s. per week, eight men, at ages ranging from 41 to 46. The maximum cost of the scheme would be £410 16s. per annum; and the outlay would, of course, become less as time went on and the number of pensions diminished.

At the last meeting of the Holborn Borough Council, Colonel W. R. Smith gave notice of the following motion: "That this Council enters its protest against the resolution of the Metropolitan Water Board to pay a salary of £500 to their Chairman for the express purpose of exercising hospitality." Copies of the resolution are to be forwarded to the Corporation of London, the London County Council, and the Metropolitan Borough Councils, with the request that they will join in the Holborn Council's protest.

BLACKPOOL CORPORATION GAS SUPPLY.

The Past Year's Working.

Mr. John Chew, the Engineer and General Manager of the Blackpool Corporation Gas Department, has just presented to the Gas Committee his report for the past financial year. He says the output of gas was only slightly in advance of that for the preceding twelve months, though the price was reduced to 2s. 2d. per 1000 cubic feet, and 525 new consumers were added. This may be partially accounted for by the shorter autumn season experienced, together with the increasing number of incandescent lights in use. Residuals were produced in larger quantities, but lower prices were realized for them, and more difficulty was experienced in their disposal. The general result of the year's working is as follows: Income, £85,520; expenditure, £63,100; gross profit, £22,420. One half of this sum being required to meet the loan charges, there remains an available balance of £11,210 for disposal, against an estimated profit of £11,191. This sum, added to the previous profits made since the Corporation acquired the gas-works, gives a total of £268,000 which the works have yielded to the town. The capital account has been increased by £200, and now stands at £210,900. Towards the repayment of this there is on hand a sinking fund of £68,000, and a reserve of £9000.

NELSON CORPORATION GAS DEPARTMENT.

The Past Year's Working.

The Gas Engineer and Manager of the Nelson Corporation (Mr. Alfred J. Hope) has presented to the Gas Committee his report for the year ended the 31st of March. It shows that the gross profit was £15,175; and, after setting aside £11,489 for interest and sinking fund charges, there is a net surplus of £3686, which is £428 more than was estimated. During the year, 27,814 tons of coal were carbonized; being an increase of 636 tons on the quantity used in the previous year. The total cost of coal delivered upon the works was £16,995, equivalent to an average of 12s. 2⅜d. per ton, compared with an average of 10s. 9d. and 11s. 9d. per ton respectively for the two preceding years. The total wages for the year amounted to £9997, while for the previous year they were £10,272 (£347 being on account of the carburetted water-gas plant). The carbonizing wages came to £3113; being 2s. 3d. per ton of coal, compared with 2s. 4½d. per ton for the year 1907-8. The total quantity of gas made was 309,696,000 cubic feet. No carburetted water gas was produced, as, in consequence of the bad state of trade during the winter months, the plant was not required. The gas made per ton of coal carbonized was 11,134 cubic feet, which compares favourably with the make in previous years. In 1907-8, it was 10,915 cubic feet. This improved make has resulted in a saving of 559 tons of coal compared with that year, and 2359 tons compared with the year ended March 31, 1903. The total quantity of gas sent out was 309,532,000 cubic feet, being an increase of 8,631,000 cubic feet, or 2·86 per cent.; and 94·69 per cent. was accounted for. There are 6778 ordinary and 5719 prepayment consumers on the books—an increase of 729. The number of prepayment consumers increased from 4951 to 5719; and the consumption per consumer averaged 14,315 cubic feet—the receipts averaging 37s. 4½d. The gas-stove department was fairly busy during the year. The gross income from residual products was £12,022; the net income, £10,583, or 7s. 7½d. per ton of coal carbonized. The net cost of coal was 4s. 7⅛d. per ton. The quantity of saleable coke was 13,176 tons, the make of tar was 1583 tons, and the sulphate of ammonia 297 tons; being at the rates of 9·48 cwt., 11·95 gallons, and 23·92 lbs. respectively per ton of coal carbonized. The gas plant of Messrs. Ecroyd and Sons, Limited, including the lighting rights over the Lomeshaye and Whitefield Estates, was purchased during the year, and the new supply was completed on the 18th of November. The gas consumed on this new supply up to March 31 was 2,498,000 cubic feet, equivalent to an income of £283. The total cost of the supply was £2866 13s. 4d. The net capital outlay on the undertaking at the close of the financial year was £125,512; and Mr. Hope points out that since 1903 it has been gradually reduced from 11s. 11d. to 8s. 1d. per 1000 cubic feet of gas made.

PROPOSED GAS-WORKS EXTENSIONS AT BIRKENHEAD.

Opposition to the Scheme.

A Local Government Board Inquiry was held on Wednesday and Thursday of last week, by Mr. F. J. Willis, with reference to an application by the Birkenhead Corporation for a Provisional Order, under sections 297 and 303 of the Public Health Act, 1875, to partially repeal, alter, or amend the Local Acts relating to their gas undertaking. The application referred to the installation of plant and a retort-house in the existing works, and the acquisition of land at the north end of the town on which to erect a holder.

Mr. Rigby Swift and Mr. A. T. Miller represented the Corporation. Mr. M'Conkey, Mr. Courthope Wilson, and Mr. Brandreth represented owners of property and others objecting to the application. Mr. G. P. Snape was present on behalf of the Birkenhead and District Co-operative Society.

Mr. Swift, in stating the case for the Corporation, said the application dealt exclusively with the gas undertaking, and arose from the necessity for the Corporation making further provision for the supply of gas. The scheme involved the reconstruction to a large extent, or the re-erection, of the buildings on the site of the present undertaking in Thomas Street. Acting under the advice of the most eminent experts in gas matters, the Corporation had arrived at the unanimous conclusion that it was imperative they should confine the present site to the manufacture of gas and to the storage plant which was already upon

it, and should find room for further storage on some new site. The application was made in order that the Corporation might have placed in their Act of Parliament which prescribed their area for the manufacture and storage of gas, a further piece of land for storage purposes only. Under the Birkenhead Corporation Act, 1881, the Corporation could not manufacture gas or residual products except upon the present site; and by section 5 of the Gas-Works Clauses Act of 1871, they could not store gas except upon the site in Thomas Street. The consequence was the Corporation desired to acquire land and store gas on it.

The opposition at this juncture intimated that they did not oppose the Corporation seeking extra facilities for the manufacture of gas; but they contended that the storage of gas could be carried out on the existing site, or on land immediately adjoining. It was also contended that the site was unsuitable.

Since 1896, continued Mr. Swift, the manufacturing capacity of the works had remained unchanged, and since 1894 the storage capacity had been unaltered. The consumption of gas, however, had increased a great deal since 1896. In that year, the maximum day's consumption was 2,753,000 cubic feet, which had since risen to 4,006,000 cubic feet. Taking the last ten years, the gas consumption in Birkenhead had increased at the rate of 1,294,000 cubic feet per annum; and the annual quantity of gas manufactured had increased from 511,000,000 to 829,000,000 cubic feet. The present capacity of the works was to supply 24,799,000 cubic feet of gas in seven consecutive days. If in 1910 there was a repetition of the demand that was made five years previously, the present undertaking would be quite inadequate to cope with it. It was proposed to re-arrange the existing works and build a new retort-house, giving an output of 39,690,000 cubic feet; and it was estimated this would give to the Corporation, taking the consumption at the present rate of increase, a reliable supply of gas for the next twenty years. The engineers were of opinion that no further storage ought to take place upon the existing site, which they considered should be utilized for the manufacture of gas only. So far as he (Mr. Swift) was aware, there was no land in the neighbourhood which was more suitable for storage purposes than the site at the north end. The present storage capacity was equal to 3,000,000 cubic feet of gas; and the Corporation were advised that it was necessary for them to meet the increased manufacturing power by providing another holder with a capacity of 2,500,000 cubic feet. With this object, they looked for a site, and found one which was ideally fixed for the purpose of providing capacity for additional storage. The site was situated at the north end of the town, and included 12,214 square yards; and there it was proposed to erect the holder. The neighbourhood was being rapidly developed. Many of the objectors to the scheme had been under the impression that there would be noxious fumes emitted from the holder. This was erroneous. So far as the amenities of the neighbourhood were concerned, the erection of the holder would be an improvement, and not a detriment. The opposition was based upon the fact that some injury would be done to the letting value of property, but such a difficulty had not been met with. The total cost of the scheme would be £35,000.

Mr. T. O. Paterson, the Gas Engineer to the Corporation, stated that there was no room for the storage of gas at the old works, as the land was too congested. The greater portion of the space was occupied by the manufacturing plant. The pressure of gas in the north portion of the town had been indifferent; and it was desirable, in the interests of the inhabitants, to improve the distribution and meet further requirements. It was customary to have outside stations for gas distribution. The land would cost 2s. 8d. a yard; and there were no restrictions whatever upon it. The land round the existing works had been quoted at £2 16s. 6d. a square yard. Fifty-two objections had been received. In cross-examination by Mr. Wilson, he said it would be throwing money away to take down the existing holder and erect a new one. He admitted it would be a public advantage if the Corporation secured the property in the neighbourhood of the gas-works, and did away with the slum area. The property in that quarter would cost about £14,000 to buy. A 10-inch main to the north end would cost £3000.

Mr. Charles Hunt said that in the early part of last year he was consulted by the Corporation as to their position; and he had gone very carefully into the questions of capacity, consumption, &c. He was of opinion that it would be unwise to attempt to enlarge the smaller existing holder, on the ground of sacrifice of capital expenditure, loss of storage for the time being, and difficulties as to the land. He calculated that the cost would be £34,000, as against £35,000 for the scheme now proposed, and, in addition, £5000 or £6000 for laying larger distributing mains. The site for the north end holder was an admirable one, and practically unobjectionable.

Mr. E. H. Stevenson, who said he had been familiar with the gas undertaking since 1886 or 1887, gave evidence generally supporting that of Mr. Hunt. He was first consulted by the Corporation at the time the holder tank cracked through the formation of the Mersey Railway tunnel. The subsoil under the existing holders was marly clay. It was a good subsoil if not disturbed; but it would not be wise to disturb it to erect the larger holder suggested. The present large holder had a brick and puddle tank; and it would be a dangerous thing to excavate deeply close to such a tank.

Mr. Courthope Wilson opened the case for the principal opponents to the application, and said this was not merely a sentimental objection by those for whom he appeared. It was obviously to the Corporation's advantage to minimize the detrimental effect to the property; but the builders took a strictly business point of view of the matter, as they wished to obtain a full return from the money expended in building operations. A banking firm had also established a branch bank at considerable expense to tap trade in a new and promising locality; and they were genuinely alarmed lest the erection of the gasholder should deteriorate the whole of the neighbourhood, and thereby drive away customers. The Legal and General Assurance Society objected to the proposed scheme as ratepayers, as they considered it a most unreasonable waste of ratepayers' money. They admitted the requirements of the borough necessitated an extension of the manufacturing and storage plant, and they also admitted the pressure at the north end was not so good as it might be; but they said it could be remedied in other ways. One of the alternative schemes proposed by the Corporation provided for the erection of a very large holder immediately south of the existing No. 4 holder; so that it was hardly open to their expert advisers to come there and say it was a physical impossibility to carry it out. The fact that the plan of the scheme was not forthcoming was a point to which he suggested the Inspector should attach considerable importance. With regard to the loss of storage

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 284.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17½—18	..	5 11 1
258,955	10	,,	7	Do. 7 p.c.	12½—12¾	..	5 9 10
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
200,000	5	Oct. 29	6½	Bombay, Ltd. . . .	5⅞—6	..	5 8 4
40,000	5	,,	6½	Do. New. £4 paid .	4⅞—4¾	..	5 15 6
50,000	10	Feb. 25	14	Bourne- } 10 p.c. . .	28½—29⅛	..	4 14 11
51,810	10	,,	7	mouth Gas } B 7 p.c. .	16½—17	..	4 2 4
53,200	10	,,	6	and Water } Pref. 6 p.c.	15½—16	..	3 15 0
380,000	Stk.	,,	12½	Brentford Consolidated	247—250	..	5 0 0
300,000	,,	,,	5⅞	Do. New . . .	187—190	..	5 0 0
50,000	,,	,,	5	Do. 5 p.c. Pref. .	122—124	..	4 0 8
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb. .	101—103	..	3 17 8
220,000	Stk	Mar. 12	10⅝	Brighton & Hove Orig.	210—213	..	5 1 0
246,320	,,	,,	7¼	Do. A Ord. Stk. .	152—155	..	5 0 0
460,000	20	Apl. 16	10	British	42—43	..	4 13 0
109,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c. .	114—117	..	5 2 7
165,700	,,	,,	4½	Do. do. 3⅜ p.c. .	85—87	..	5 3 6
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd.	13¾—14¼	+⅛	4 18 3
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
100,000	10	—	—	Cape Town & Dis.. Ltd.	4⅜—5⅛	..	—
100,000	10	—	—	Do. 4½ p.c. Pref. .	5—6	..	—
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	48—50	..	6 0 0
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	77—79	..	5 13 11
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord. . .	109—111	..	4 10 1
1,491,280	Stk.	Mar. 12	5⅝	Commercial 4 p.c. Stk. .	106—109	..	4 15 5
560,000	,,	,,	5	Do. 3½ p.c. do. .	101—103	..	4 17 1
475,000	,,	Dec. 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	6¾	Continental Union, Ltd.	101—103	..	6 6 3
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—141	..	4 19 3
492,270	Stk.	—	5	Derby Con. Stk. . . .	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk. . . .	103—105	..	3 16 2
148,995	,,	Mar. 31	5	East Hull 5 p.c. Ord. .	97—99	..	5 1 0
486,930	10	Jan. 28	12	European, Ltd. . . .	23⅝—24½	..	4 19 0
354,660	10	,,	12	Do. £7 10s. paid.	17¾—18¼	..	4 18 5
15,161,545	Stk.	Feb. 11	4/10/8	Gas } 4 p.c. Ord. . .	103—104	..	4 7 0
2,600,000	,,	,,	3⅜	light } 3½ p.c. max. .	88—89	..	3 18 8
3,799,735	,,	,,	4	and } 4 p.c. Con. Pref.	105—107	..	3 14 9
4,193,975	,,	Dec. 11	3	Coke } 3 p.c. Con. Deb.	85—86	..	3 9 9
258,740	Stk.	Mar. 12	4⅜	Hastings & St. L. 3½ p.c.	93—95	..	5 0 0
82,500	,,	,,	6¼	Do. do. 5 p.c.	117—120	..	5 4 2
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	17¼—17⅝	—⅛	6 4 0
123,500	Stk.	Mar 12	6½	Ilford "A" and "C" .	134—136	..	4 15 7
65,780	,,	,,	5	Do. "B"	103—105	..	4 15 3
51,000	,,	Dec. 30	4	Do. 4 p.c. Deb. . . .	102—104	..	3 16 11
4,940,000	Stk.	Nov. 13	8	Imperial Continental .	184—186	+½	4 6 0
473,600	Stk.	Feb. 11	3⅜	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c. .	117—119	..	5 0 10
£			p.c.				£ s. d.
561,000	Stk.	Feb. 25	10	Liverpool United A. .	225—227	+2½	4 8 1
718,100	,,	,,	7	Do. B . .	168—170	..	4 2 4
306,083	,,	Dec. 30	4	Do. Deb. Stk.	105—107	..	3 14 9
75,000	5	Dec. 11	6	Malta & Mediterranean	4⅜—5	..	6 0 0
560,000	100	Apl. 1	5	Met of } 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 13	3⅜	Monte Vid o Ltd. .	12½—12¾	..	5 9 10
1,775,892	Stk.	Feb. 25	4½	Newc'tle & G't sh'd Con	107—108	..	4 3 4
518,795	Stk	Dec. 30	3⅜	Do. 3½ p.c. Deb.	91—93	..	3 15 3
15,000	10	Feb. 25	10	North Middlesex 10 p.c.	19⅜—20	..	5 0 0
55,940	10	,,	7	Do. 7 p.c.	13—13½	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd. . . .	137—139*	+½	5 15 1
60,000	5	Mar. 31	8	Ottoman, Ltd. . . .	6—6¼	..	6 8 0
31,800	53	Feb. 25	13	Portsea Island A. . .	135—137	..	5 0 7
60,000	50	,,	13	Do. B. . .	129—131	..	4 19 3
100,000	50	,,	12	Do. C. . .	119—121	..	4 19 2
124,800	50	,,	10	Do. D and E.	101—103	..	4 17 1
398,490	5	Oct. 29	7	Primitiva Ord. . . .	7—7⅛	+⅛	4 13 4
796,580	5	Jan. 28	5	Do. 5 p.c Pref. .	5⅛—5⅜	+⅛	4 13 0
488,900	100	Dec. 1	4	Do. 4 p.c Deb. .	95—97	..	4 2 6
1,100,000	10	Apl. 29	8	River Plate Ord. . . .	14¼—14¾*	+⅛	5 8 6
312,650	Stk	Dec. 30	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
250,000	10	Mar. 31	8	San Paulo, Ltd. . . .	13¼—14	..	5 14 4
62,500	10	,,	—	Do. 6 p.c. Pref. .	11⅛—12	..	5 0 0
125,000	50	Jan. 2	5	Do. 5 p.c. Deb. .	50—51	+⅛	4 18 0
135,000	Stk.	Mar. 12	10	Sheffield A	236—238	..	4 4 0
207,998	,,	,,	10	Do. B	233—235	—2	4 5 1
523,500	,,	,,	10	Do. C	234—236	..	4 4 9
70,000	10	Oct. 29	10	South African	14—14⅛	..	6 17 11
6,429,895	Stk.	Feb. 11	5/6/8	South Met., 4 p.c. Ord.	123—125	..	4 5 4
1,895,445	,,	Jan 14	3	Do. 3 p.c. Deb.	85—86	..	3 9 9
209,820	Stk.	Mar. 12	8	South Shields Con. Stk.	152—154	..	5 3 11
605,000	Stk.	Feb. 25	5⅛	S'th Suburb'n Ord. 5 p.c.	120—122	..	4 10 2
60,000	,,	,,	5	Do. 5 p.c. Pref. .	122—124	..	4 0 8
117,058	,,	Jan. 14	5	Do. 5 p.c. Deb. Stk.	124—126	..	3 19 4
502,310	Stk.	Nov. 13	5	Southampton Ord. . .	109—111	..	4 10 1
120,000	Stk.	Feb. 25	6⅜	Tottenham } A 5 p.c. .	132—134	..	5 0 9
423,940	,,	,,	5⅛	and } B 3⅜ p.c. .	109—111	..	4 14 7
149,470	,,	Dec. 30	4	Edmonton } 4 p.c. Deb.	101—103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	8⅜—9⅜	..	8 13 0
149,900	10	Jan. 14	5	Do. 5 p.c. Deb. Red.	101—103	+1	4 17 1
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	105—107	..	4 13 6
255,666	Stk.	Feb. 25	6⅜	Wands- } B 5⅛ p.c. .	131—133	..	4 17 9
79,416	,,	Dec. 30	3	worth } 3 p.c. Deb. Stk.	72—74	..	4 1 1
895,872	,,	Feb. 25	5⅛	West Ham 5 p.c. Ord. .	119—121	..	4 6 1
210,000	,,	,,	5	Do. 5 p.c. Pref. .	125—127	..	3 18 9
253,300	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk..	107—109	..	3 13 5

Prices marked † are "Ex div."

capacity of the smaller holder, if the scheme he suggested was carried out, the Corporation would have two large holders with 5,000,000 cubic feet total capacity, which, on the Corporation's own evidence, was ample for the requirement of the borough for many years ahead. As to the capital value of the small holder, £9000, he should say it had been written off in the 31 years it had been used. There were a number of sites at the north end not immediately contiguous to residential property; for there was a quantity of derelict land there.

Mr. Isaac Carr, who was called on behalf of the opposition, stated that he had carefully examined a plan of the existing gas-works at Birkenhead, and considered there was ample space for increased manufacturing and storage purposes. He saw no difficulty, judging by the plan, in so developing the works that all requirements could be met. Were he responsible for the works, he should never think of doing what the Corporation now proposed. It would be greatly to the advantage of both the Corporation and the gas consumers to confine the manufacture and the storage to the existing site. He saw no objection to destroying No. 1 holder, having regard to its age, and erecting a larger one in its place. He would undertake to erect the suggested larger holder between February and December in one year. He had not been over the works; he judged by the plan. The cost of pumping to the proposed new holder would be a serious matter. He had found the concentration of works at one spot was much more economical than dividing them.

At the completion of the evidence for the opposition, Mr. Swift urged that there were no reasons whatever why the Local Government Board should refuse their sanction to the scheme put forward by the Corporation.

GAS-METER TESTING IN MIDDLESEX.

The General Purposes Committee of the Middlesex County Council report that, during the quarter ended March 31, 22,402 gas-meters were tested, in respect of which the fees payable amounted to £678 10s. During the year ended March 31, the expenditure in connection with the gas-meter testing-station was £1435 19s. 9d.; and the fees received or due amounted to £2486 14s.—leaving a balance in favour of the Council of £1050 14s. 3d. The Committee further submitted a report from Inspector Barney on the work of the station during the past year. It appears from it that during the nine years the testing work, &c., has been carried on a total of 679,051 meters have been submitted for test, and fees amounting to £20,558 12s. 6d. charged in respect of them; such fees varying from a minimum charge of 6d. upwards, according to the size of the meter. The number of meters tested and the amount of fees charged during the past year were as follows: Quarter ending June 30, 1908, meters 19,156, fees, £588 13s.; quarter ending Sept. 30, meters, 20,165, fees £602 18s. 6d.; quarter ending Dec. 31, 20,835, fees £627 10s. 6d.; quarter ending March 31, 1909, meters, 22,402, fees £678 10s.—total, meters 82,558, fees £2497 12s. The totals for the previous year were: Meters 82,382, fees £2511 15s. 6d. Thus a larger number of meters tested show a slight decrease in fees; but this is explained by the fact that out of the total of 82,558 meters a larger proportion than usual—69,25c—were tested at the minimum fee of 6d. Of the total number of meters tested during the past year, 4244 were received from gas companies and consumers, compared with 3067 received the previous year. Of the former number, 1818 were stamped and 2426 rejected. The remaining 78,314 meters were received from makers; and 76,101 were stamped and 2213 rejected.

Fatal Defective Gas-Fittings at Belfast.—At an inquest on the body of a man named Graham who lived in Belfast, the widow stated that her husband was in his usual health when he retired to rest on the 24th ult. Next morning there was a strong smell of gas from his bedroom; and she found there was an escape, while Graham was breathing very heavily. The gas-bracket in the bedroom did not work properly. Deceased had complained to the agent, and men had been sent to remedy whatever defect existed; but apparently they had not been able to do so. Deceased got tired of having the carpets lifted to allow the men to work at the pipe, and told them that there must be some other way of doing it. A constable said that after Mrs. Graham told him the gas was defective he lighted it, and it went out in less than five minutes. Dr. M'Arthur gave evidence to the effect that when Graham was brought to the hospital, life was extinct; death being due to carbon monoxide poisoning. The Jury returned a verdict in accordance with the medical evidence, finding that the deceased inhaled the gas as the result of an escape from defective fittings.

Ipswich Water Supply.—In submitting the accounts and balance-sheet of the Water Committee to the Ipswich Town Council, Mr. W. O. White, the Chairman of the Committee, pointed out that, while it was not proposed to vote anything in the reduction of the rates this year, the undertaking had given £5000 in reduction of rates in past years. Seeing that they had done this on a profit of ¼d. per 1000 gallons, it could not be said that they had been guilty of charging the consumers excessively. The capital outlay on the water-works had been £277,000, and interest had to be paid on a large portion of it; but a valuable property was being created, and he thought the ratepayers had every reason to be well satisfied with the way the concern was managed. More water would be required; but he did not propose to deal with this question then, except to say that it was on the ground of expected operations that no grant was made towards the rates. Last year they used one week 93 per cent. of the available supply of water, which showed how near they were to using up their supply. The water from the gravitation sources was only half what it was a few years ago. The balance-sheet showed that the water-rental for the year was £18,284, against £18,099 in the previous year. The gross profit was £11,390, and the net profit £810, against £821 net profit in 1908. The total balance in hand on net revenue account was £2446.

Further Proof

that the "New Davis" Screwless Cooker is, first and foremost, a MAINTENANCE COOKER is found in the following incident:

The Engineer of a prominent Gas Company was sceptical as to the possibilities of the "New Davis" in this direction. In order to convince him, we sent a fitter to his works to demonstrate, in the presence of the Engineer and several members of his staff, the rapidity with which the Screwless Cooker could be taken to pieces and put together again.

RESULT:

	Minutes.	*Seconds.*
Time occupied in dismantling . . .	**1**	**37**
" " re-assembling . .	**16**	**0**

Total time occupied in dismembering every single part, and reconstructing the Cooker in a thorough and workmanlike manner—

17 minutes, 37 seconds.

The Engineer is now a convinced and enthusiastic devotee of the Davis Screwless Cooker.

TO CONVINCE YOU we are willing to demonstrate that the same operation can be performed at any time in less than 20 minutes.

The Davis Gas Stove Co., Ltd.,

Diamond Foundry, LUTON.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At their monthly meeting last Monday, the most important business at which is noticed in another column, the Edinburgh and Leith Gas Commissioners had under consideration one or two other items of some interest. The Engineer's report for the month of March showed an increase in the output of gas, compared with the corresponding month of last year, of 3,525,000 cubic feet. When, however, comparison is made of the periods from the 16th of May, it is found that in the current year there has been a decreased output to the extent of 59,310,000 cubic feet, which is equal to 3·16 per cent. The average illuminating power of the gas, corrected to standard temperatures and pressures, was stated to be 19·35 candles, compared with 20·35 candles in March of last year. This is not a large reduction for a body who have power to go down to 14 candles. It was stated before the Parliamentary Commission in July last that whatever reduction there might be would be made gradually—and the statistics submitted bear out this statement. As having some relationship to the decrease in the output of gas, it may be mentioned that the rental in the three months ending the 15th of March showed a decrease of £4541. The requirements of the Scottish Office in matters of finance are so strict as to almost make business impossible. They spell precaution pushed to an extreme. This is the position with reference to the statutory provisions; but it is much more true of the requirement of Mr. Lisle, C.A., the Actuary who reported upon the solvency of the proposed scheme of superannuation. It would almost seem that he, probably through long association with matters in the abstract, had forgotten that the proposed scheme was intended to be managed by intelligent beings, who might be trusted to find means for filling up blanks as they arose. His requirement that everything should be found geometrically perfect before the scheme should be launched is a principle hitherto unheard of in business. Suppose it were to be applied, and before anyone were allowed to engage an assistant for a year he should be required to deposit, in security, the full amount which he would earn during the year, how many assistants would be engaged? If such uncalled-for stringencies as are here attempted are to be insisted upon, how many more superannuation schemes will be proposed? The Commissioners make an alternative offer, which would be an easier method for them of complying with the wishes of the Actuary, but would not get the burden off their shoulders. It is doubtful if they will be allowed their method of an annual contribution instead of providing a lump sum. If they are not, a huge burden will be laid upon the Commissioners in addition to those—without doubt heavy enough—which were known to exist in the Provisional Order when it left the hands of the official legislators in the Scottish Office. It is no wonder that the Commissioners wished to protest against the treatment they have received. This treatment, it may be assumed, has not been adopted with the intention of discouraging enterprise in gas matters; but its effect is, without doubt, discouraging. Unfortunately, it is treatment at the hands of officials who are permanent, and whose policy not even a General Election would change. Many years ago, the late Lord Salisbury warned the community against the rise in power of the permanent official; and his warning bids fair to be well justified. The other subject—about the alleged introduction of air into the gas—was met by the Convener of the Works Committee with a denial that the practice exists; and I would not refer to it but for the fact that it will be mentioned again when the Committee report.

A meeting of the Gas Committee of the Dumfries Town Council, which comprises all the members of the Council, was held in the end of last week to further consider the question of filling the vacant post of Gas Manager. The Clerk submitted returns he had received from sixteen different towns in Scotland, of a similar size to Dumfries, and showing that in them the rate of remuneration of gas managers varies from £200 to £500 per annum. There was considerable discussion in regard to the appointment. It was moved that the situation be advertised; also that Mr. John Smith, the Under-Manager, and Mr. S. Dickie, the Chief Clerk, be appointed Joint Managers, at a salary, in each case, of £200. The latter proposal was adopted by 12 votes to 11. It has still to be submitted to the Town Council in open session. Mr. Smith at present has a salary of £130, and Mr. Dickie one of £140. Mr. Smith has two brothers who are gas managers—one at Hawick and the other at Stirling.

As is well known, the water supplied in Aberbeen is looked upon by many as being unsatisfactory, in respect that, being taken from the River Dee, it is liable to pollution. Those who hold this view have just been able to disclose facts which confirm their opinions, and must be very disquieting to the community. Last Monday, the Water Committee, with Lord Provost Wilson, the Convener, at their head, went on a visit to Tarland, an inland village, to inspect the irrigation works which the Aberdeen County Council erected there two years ago at considerable expense. After the arrangements were completed, the District Committee of the County Council let the place to a farmer or market gardener, who undertook to attend to the distribution of the sewage over the land. The Water Committee, however, found that this undertaking was not being observed, but that, instead of the land being used for the treatment of the sewage, it was being cultivated for the growing of vegetables; and whenever the tenant thought his crops had had sufficient irrigation, he turmed the whole of the sewage into the stream which flows into the Dee. On Monday, sewage was flowing into the stream at the rate of 10 or more gallons per minute. It was also found at Lumphanan that sewage effluent was reaching the Dee in an unpurified condition. The Committee concluded that the only method available for securing proper attention to sources of pollution is for the Town Council to acquire the works and look after them themselves. Meanwhile, the Town Clerk was instructed to write to the District Committee drawing attention to the reprehensible manner in which things are being conducted.

CARRON

AWARDED GRAND PRIX

Carron Gas Cookers ensure a steady source of revenue to the Gas Company and entire satisfaction to the Consumer.

FRANCO-BRITISH EXHIBITION

Write for No. 6 New Gas Cooker Catalogue to

Carron Company
INCORPORATED BY ROYAL CHARTER 1773

Works: CARRON, Stirlingshire.

GAS COOKERS.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 1.

Sulphate of Ammonia.

The month's requirements being covered, and there being very little new business coming forward, the tone of the market has been weak, and parcels offered have not found a ready sale. Home demand, too, has slackened. Consequently, the closing quotations are £11 5s. per ton f.o.b. Hull, £11 7s. 6d. per ton f.o.b. Liverpool, and £11 10s. per ton f.o.b. Leith. There has been a fair amount of inquiry in the forward position, but makers have not shown much disposition to meet it. There has, however, been speculative selling abroad at about the equivalent of spot prices.

Nitrate of Soda.

Although prices have been fairly well maintained, demand has not been altogether satisfactory, and the month closes with very heavy stocks in Europe. The spot prices are 10s. 3d. per cwt. for 95 per cent., and 10s. 6d. for refined quality.

LONDON, *May* 3.

Tar Products.

The markets for tar products are still quiet, with the exception of pitch, which remains firm, and several large transactions have taken place at an improved price. Creosote keeps steady; but benzols are very weak.

The average values during the week were: Tar, 13s. 6d. to 17s. 6d., *ex* works. Pitch, London, 25s. 3d. to 25s. 6d.; east coast, 24s. 9d. to 25s.; west coast, 24s. 3d. to 25s. 3d. f.a.s. Mersey ports, 24s. to 24s. 6d. f.o.b. others. Benzol, 90 per cent., casks included, London, 6d.; North, 5½d. to 5¾d.; 50-90 per cent., casks included, London, 6¼d. to 6⅜d.; North, 6d. to 6¼d. Toluol, casks included, London, 8¼d. to 8½d.; North, 7¾d. to 8d. Crude naphtha, in bulk, London, 3⅝d. to 3¾d.; North, 3d. to 3¼d.; solvent naphtha, casks included, London, 10⅞d. to 11¼d.; North, 9¼d. to 9⅝d.; heavy naphtha, casks included, London, 10⅞d. to 11¼d.; North, 9¼d. to 9⅝d. Creosote, in bulk, London, 2⅜d. to 2⅝d.; North, 2¼d. to 2⅜d. Heavy oils, in bulk, 2 15/16d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 1¼d. to 1s. 2d.; west coast, 1s. 1d. to 1s. 1⅛d. Naphthalene, £4 10s. to £8 10s.; salts, 36s. 6d. to 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1⅛d. to 1¼d. per unit, packages included and delivered.

Sulphate of Ammonia.

As there has been no covering in for the end of the month, the market for this article has weakened somewhat. The demand also from the east has been very quiet. To-day actual Beckton is quoted £11 15s.; ordinary makes on Beckton terms, £11 5s.; Hull, £11 5s.; and Liverpool, £11 7s. 6d. In Leith, £11 10s. to £11 12s. 6d. is asked.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is very active, and there is a strong demand, more especially for best steam and gas coals. In the steam coal trade, best Northumbrians are now very firm; and the opening out of the Baltic trade causes the shipments to be heavy. Prices vary from about 12s. to 12s. 6d. per ton f.o.b. Second-class steams are from 10s. to 10s. 9d.; and steam smalls are firmer at from about 5s. 6d. to 6s.—the export demand for the latter class being fuller. Production is full; and the output is well taken up. In the gas coal trade, the demand is steady, and prices are firm, particularly for best kinds. The current quotations are from about 9s. 3d. to 10s. 6d. per ton f.o.b., according to quality, for the usual classes; and up to 10s. 9d. for "Wear specials." Some further sales of gas coals have been made for export, especially to some of the Mediterranean ports, at prices not far from those above quoted. One or two local contracts are also in the market, for periods of a year; and it is expected that these will be taken at slightly below the current values, though the difficulty as to the Eight Hours' Act may influence prices for far forward delivery. Coke is firmer; and this may affect gas coke. Good gas coke is rather in lessened supply; and this steadies the market—the price being from 12s. 9d. to 13s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

The market does not improve. An attempt is being made to enhance the position of ell and splint, by the circulation of the statements that they are being "cornered." The quotations bear out that ell is commanding a better price, but that splint is declining. The prices given are: Ell 8s. 9d. to 10s. 3d., splint 9s. 9d. to 10s., and steam 9s. to 9s. 9d. The shipments for the week amounted to 306,815 tons—an increase of 3743 tons upon the previous week, and of 16,577 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,102,834 tons—an increase of 262,550 tons upon the corresponding period.

The "Glasgow Evening Citizen" has given publicity to a not very plausible story regarding a "corner" which it is said has unexpectedly come into operation in the coal market in connection with the position of certain well-known qualities of splints and ells. The coal trade has, it is said, been in a very depressed state for a good while, notwithstanding that export shipments have been heavy, and in the aggregate considerably ahead of those of last year. Prices, however, have been poor, and in many cases unremunerative; and the opinion obtaining in various quarters is that the situation has been aggravated by short selling on the part of merchants and exporters. So long as supplies of ordinary sorts were plentiful, no trouble for buyers supervened. This trouble, it is asserted, has suddenly cropped up in relation to the meeting of requirements in what are known in the trade as "named" coals. It appears, the article goes on to say, that months ago exporters and

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others sold these coals in large quantities for spring shipment, but did not cover; and now that deliveries are desired, the coal is not procurable on the conditions upon which the transactions were entered into. In the previous few days, oversold dealers had been obliged to pay to particular coalmasters as much as from 2s. to 3s. per ton above normal market prices, so as to be able to meet their requirements; and the writer stated his belief that even stiffer fines might have to be fixed before the squeeze came to an end. The market quotations certainly do not give much support to the statements in the article.

Brighouse Gas Managership.—The Brighouse Town Council have decided that the existing arrangement for the management of the gas-works shall be brought to a close; and a new Manager is being advertised for. For fifteen years Mr. James Parkinson has occupied the dual position of Town Clerk and Gas Engineer, with an Assistant as Works Manager; but in future he will have no professional connection with the Gas Department.

Murder by Gas at St. Helens.—An inquest was held last week at St. Helens on the bodies of a glassmaker, named Mason, and his son, who were found in bed suffocated by gas. The man's head was enveloped in a pillow-case; and an india-rubber tube, one end of which was attached to a gas-bracket, had apparently slipped from his mouth. He had also a wound in his neck. The boy had a scarf tied round his neck; and there was clear evidence that an attempt had been made to strangle him. The doctor said that probably gas had been given to the child first, and then the scarf was wound round his neck. The Jury returned verdicts of "Wilful Murder" and "Felo de se" against the father.

Fatality through a Gas-Grill.—At the Southwark Coroner's Court last Tuesday, Dr. F. J. Waldo held an inquiry with reference to the death of Ellen Victoria Philpott, aged 5½ years, whose parents live at No. 240, Southwark Bridge Road, and who died in Guy's Hospital as a result of having been severely burnt by a lighted gas-grill. The mother stated that she left the child for a short time with a younger brother in the kitchen on the previous Saturday. The gas-grill was half on, and she was about to return when she heard a loud noise followed by a scream. She hurried back to the kitchen and found the child in flames. In reply to the Coroner, witness said she had just lit the grill and told the children not to go near it. When she visited her child in the hospital, the latter said: "I went to stand on a chair to get my school-bag when my clothes caught alight." The Coroner asked witness if she had a fire-guard. Witness replied that she had, but did not put it round the gas-stove. The Coroner said it was a sad case; but, under the circumstances, the mother was not liable under the Children Act, as it was a gas-grill that caused the fire. No gas-stoves were included in the new Act; and he failed to understand why. As it was, there might be many fatal accidents caused by gas-stoves; and he felt that some day they would be included. The Jury returned a verdict of "Accidental death."

Lambeth Public Lighting.—At the meeting of Lambeth Borough Council last Thursday, the Lighting Committee reported that the average time during which the lamps in the Gaslight and Coke Company's district were alight during the period from the 1st to the 31st of March was 11 hrs. 30 min. 54 secs. per night. The fixing of the automatic apparatus to the lamps has been completed, and the date from which the reduction of 1s. 6d. per lamp per annum will take effect has been agreed as the 8th of February last. During the month of March, 1330 cases were reported to the Company of lamps having been defective or out of lighting. About one-third of the cases were of lamps not lighting up at night, and the other two-thirds of lamps remaining alight in the morning. Each defect was remedied in less than an hour after its occurrence. The Committee pointed out that no additional liability was incurred by the Council from the lamps remaining alight in the morning, as a fixed charge is paid for each lamp.

Proposed Gas Supply for Treeton and Catcliffe.—The subject of a gas supply for Treeton and Catcliffe has been discussed at a third joint meeting of the Parish Councils. At the last meeting, it was decided not to adopt a scheme proposed by Mr. Henry Ellison, of Cleckheaton, to supply gas from works he contemplated erecting at Beighton. This decision came about owing to Mr. Ellison's change of plans; he having earlier promised to erect his plant at Treeton or Catcliffe. Correspondence was now placed before the meeting with regard to the Council's inquiries concerning a proposal for the two parishes to combine and form a local Company. It was stated that a sum of £5000 would be required to start a Company, and that Mr. F. J. Jones, Managing-Director of the Rothervale Company, had promised that for every £1 raised in the district, he and his friends would put up a like sum. It was decided to call a general meeting of ratepayers to discuss the matter.

A Birmingham Manufacturer's Strange Death.—An open verdict was returned by the Coroner's Jury who were appointed to inquire into the death of William Williams, a fender ornament manufacturer of Birmingham, who died from coal gas poisoning. Clara Williams, a daughter, said deceased was a widower, and had not been well for six months. He had complained of his head and his heart; and she had known him to faint. On the evening of his death, after eight o'clock, he went to his workshop. He had been talking about his gas-engine, but had not done any work that day. A quarter-of-an-hour afterwards witness thought she heard the engine working, but on going into the yard saw it was not. She went to the workshop and found the door open, but no light in the place. She noticed a smell of gas, and going a little way into the shop struck against her father's foot. She thought the gas was on at the engine and escaping, and she went and turned it off. She had never known deceased to threaten his life; but she had known him to start the engine many times when not at work. He was very proud of his engine. Herbert Williams, brother of deceased, said he found the gas-pipe disconnected at the joint from the engine. He suggested that deceased had been doing some repairs to the engine, and had forgotten to turn off the gas-tap on the feed-pipe. The windows in the shop were all broken.

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Increased Water Supply for Llandudno.

Last Tuesday, Lord Stalbridge, the Chairman of the London and North-Western Railway Company, inaugurated at Llandudno a duplicate water-main, 15 inches in diameter, which will convey water to the town from Llyn Dulyn and Melynllyn—two lakes belonging to the Llandudno Urban District Council, situated quite close to Carnedd Llewelyr, at an altitude of more than 1700 feet. The first pipe from these lakes was opened by the King, when Prince of Wales, in June, 1880. The new pipe has cost upwards of £33,000, and has been constructed in sections over a period of ten years. On his arrival, Lord Stalbridge was presented with an address of welcome on behalf of the Council, and then proceeded to a spot where two hydrant stand-pipes had been fixed, to which were attached a couple of hose lengths, and turned on the water. Immediately two powerful streams were thrown from 50 to 60 feet in the air. After allowing the jets to play for a few minutes, the water was turned off. A model in silver of the valve-key used by his Lordship to turn on the water was presented to him by the Chairman of the Council (Mr. M'Masters); and the ceremony concluded with three cheers for the distinguished visitor. The event was celebrated by a luncheon at the Imperial Hotel.

Liverpool Gas-Fittings Company, Limited.—In the report which the Directors of the Company will present at the annual meeting on the 12th inst., they state that the net profit for the year ended the 31st of March was £1508. Adding the balance brought forward makes a sum of £1633 to the credit of the profit and loss account. The Directors recommend a dividend at the rate of 10 per cent. with a bonus of 1s. per share (free of income-tax); after payment of which there will be left £133 to go to the next account.

New Yorkshire Coalfields.—It is stated that a Syndicate of Yorkshire, Nottinghamshire, and Derbyshire colliery owners have leased 7000 acres of land at Barnby Junction for the purpose of establishing a colliery. It is definitely known that there is a large deposit of coal in the neighbourhood, and the experts engaged in the work fully expect to tap the valuable Barnsley seam, 2000 feet down. Sinking operations are being commenced immediately; and it is anticipated that the colliery will shortly be turning out about 30,000 tons of coal per week.

Rhyl Water Supply.—At a recent meeting of the Rhyl Urban District Council, Mr. Wallis, in moving the adoption of the report of the Water Committee, mentioned that the past financial year had been the first in which the undertaking had managed to pay its way. Referring to the matter, the "Rhyl Record" said: "One is glad to note that, after many years of hard struggling with unfair odds, the Water Department has this year paid its way—an achievement which reflects the greatest credit upon our painstaking and capable Water Engineer, Mr. L. G. Hall, who has had formidable obstacles to overcome. No better tribute could be paid to anyone than the solid and the convincing success just attained."

Buenos Ayres (New) Gas Company, Limited.—The accounts of the Company for the past year, which will be submitted to the proprietors at the annual general meeting on Thursday, show that the profit, after writing off bad debts and making ample provision for doubtful ones, is £67,771. Adding the profits from other sources (£21,320) and the amount brought forward (£26,273), a total of £115,364 is produced. This sum the Directors recommend should be appropriated as follows: Debenture interest, £10,000; interim dividend of 6s. per share, free of income-tax, £21,000; to reserve, £42,436; final dividend of 8s. per share, making 7 per cent. for the year, tax free, £28,000; to be carried forward, £13,928. Out of the year's revenue, the sum of £27,946 was expended on the upkeep of the works, mains, &c., all of which are reported to be in a high state of efficiency.

A Challenge at Ilfracombe.—The usual statements having been inserted in the Ilfracombe papers in regard to electric light with the new metallic filament lamps being "cheaper than gas," Mr. L. Fletcher, the Managing-Director of the Welsbach Incandescent Gaslight Company, has issued his well-known challenge to instal a house in the town with Welsbach light if the electricity people will instal a precisely similar one with electricity, the consumption and candle power of each installation to be tested at regular intervals throughout the year by two independent experts—one gas and one electric. Should the result not prove that, light for light, the Welsbach light—allowing for renewals at current prices—comes out at one-half the cost of the Osram light, the Welsbach Company would pay for their installation and subscribe £50 to any local charity. If the contrary, the Electric Light Company would have to pay for the gas installation and give a like amount for a charity. It will be interesting to see whether this very fair challenge is taken up.

Gas and Electricity at Chelmsford.—Some outspoken remarks about the electric light were made in the Chelmsford Town Council when the Lighting Committee recommended that a few new lamps should be provided and lit by the Gas Company, at a charge of £3 a year—a petition having been received from certain residents that electricity should be employed. Alderman Feather expressed the opinion that the small electric lamp could not compare with the gas-lamps. The latter were three or four times better than what had been described as the "glow-worms." Besides, the electric lamps cost £3 3s., and the gas-lamps £3. He reminded the members, too, that they had nothing but complaints as to the electric lighting. In view of the time when the contract with the Electric Supply Corporation would expire, he thought this would be a good opportunity to compare the two systems of lighting. Mr. Osborn said it would be a gross insult to Messrs. Crompton to put up gas-lamps close to the Company's works. Mr. Farrow moved that electric light be provided, and said it was not fair to put up gas-lamps in this new district, seeing that the Electric Light Supply Corporation had the contract for the lighting of the borough. Mr. Driver said, though a shareholder in the Gas Company, he should second the amendment. Mr. Leach said the idea of those who recommended gas was to bring the Electric Supply Corporation "up to the scratch." The amendment was carried by 17 votes to 10.

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Matlock and District Gas Company.—According to the last annual report of the Company, there was a profit of £2490 on the working in the year ended Dec. 31, 1908. Adding the unappropriated balance of £3573, this sum was brought up to £6065. This had to bear the interim dividend and the debenture interest, amounting together to £1568; leaving £4497 for disposal. The Directors recommended the payment of a dividend for the half year ended Dec. 31 at the rate of 6s. per share, which would require £1413; leaving £3084 to be carried forward. A large number of new services were laid during the past year. In consequence of the growing consumption of gas, it has become necessary to provide additional storage. The Directors have therefore entered into a contract for the erection of a new holder. They have also decided to increase the capital of the Company.

The Fulbourn Asylum Lighting Scheme.—It may be remembered that the question of the lighting of the Fulbourn Asylum, Cambridge, was some months ago the subject of much discussion by the Committee of Visitors; the difficulty before them being a decision as to the illuminant to be employed. Offers were received from the Cambridge Electric Supply Company and the Cambridge Gas Company; but in the result the offer of the former was withdrawn, and an amended offer of the Gas Company accepted, on the advice of Mr. Graham Harris, who had been consulted by the Visitors. He also advised that all the gas-burners in the Asylum should be of the most modern inverted incandescent mantle type. It was estimated that the annual cost of the lighting would be £303; and the new fittings and other matters made up a total of £1778. This amount has been apportioned between the county, the borough, and the Isle of Ely. At the meeting of the Visitors on Monday last week, it was reported that an agreement with the Gas Company had been prepared, and that it would be settled as soon as sanctioned by the three bodies concerned in the scheme.

The Master of the St. Pancras Workhouse has reported that a new system of up-to-date gas-fittings which has been installed cost £107 9s., being £6 19s. 3d. less than the estimate; but that as the result of this expenditure the reduction in the cost of gas consumed during the last quarter was no less than £82 18s. 1d.

"Hints on House-Letting" is the title of a small but attractive pamphlet which has just been issued by John Wright and Eagle Range, Limited. It has been prepared with the view of inducing builders to pipe new houses for gas-heated appliances, instead of putting in the hot-water boilers and washing coppers now generally in use. Particulars and prices are given of the firm's "Sun" boiler and their "Gyp" portable copper.

Last Wednesday morning, the fully-clad body of Mr. R. Barry Peard, the South Wales and West-of England representative of Messrs. T. Glover and Co., Limited, and Messrs. R. & A. Main, Limited, was found on the rocks at Porthcawl. He arrived in the town the previous Friday, and next morning left his hotel, as was supposed, for the purpose of taking a walk. From that time he was not seen until the finding of his body as recorded above.

At a recent meeting of the Ramsgate Corporation Gas and Water Committee, it was proposed, "That where the Engineer gives permission to an employee to join the Territorial Force, such employee be granted half-pay during the minimum time he must attend camp." Mr. Chapman entered a strong protest; characterizing the action of the Committee as mean in the extreme. It was pointed out, however, that the men would have their full military pay as well, and that there were from forty to fifty men in the department who were eligible to join; and, were full pay granted, the working of the department would suffer through so many being away at once. The proposition was adopted.

APPLICATIONS FOR LETTERS PATENT.

9182.—Dye, F. W., "Carburetting air." April 19.
9211.—Bean, H. R., "Generating acetylene." April 19.
9251.—Rauthmell, T., "Generating acetylene." April 19.
9327.—Brindley, H. S. B., "Valves for control of pressures." April 20.
9339.—Cliff, A., and Williamson, F. W., "Gas-retorts." April 20.
9379.—Hill, F. B., "Couplings for pipes." April 20.
9434.—Tirotka, B., "Incandescent gas-lamps." April 21.
9468.—Withers, A. W., "Gas-producer plants." April 21.
9473.—Scott-Snell, E., "Air-gas." April 21.
9482.—Downs, J. H., and Wright, H. F., "Ladders for use with spirally-guided gasholders." April 21.
9483.—Wright, H. F., "Ladders for use with spirally-guided gasholders." April 21.
9484.—Downs, J. H., and Wright, H. F., "Ladders for gasholders." April 21.
9485.—Wright, H. F., "Water-lutes of gasholders." April 21.
9487.—Kamp, W. J. A. van de, "Preventing explosions and danger from the escape of gas." April 21.
9518.—Brenot, M. C., "Analyzing gaseous mixtures and recording the result." April 21.
9538.—Andrews, G., "Incandescent burners." April 22.
9644.—Hopkins, J. H., "Compressor or exhauster." April 23.
9688.—Heath, A. W., and Harrison, C. H., "Inverted burner." April 23.
9720.—Barham, A. W., "Petrol-air gas." April 24.
9723.—Lea, J. E., "Meter." April 23.
9740.—Oulton, J., and Newhouse, W. A., "Anti-vibration incandescent burner." April 24.
9752.—Clowes, R. S., "Mantle-rod. April 24.
9757.—Sperryn, G. N., "Inverted burners." April 24.
9783.—Thornton, A. A. "Hydrocarbon lighting apparatus." April 24.
9793.—Dargue, W. H., "Production of acetylene." April 24.
9798.—Menz, A., "Compressing coal gas." April 24.

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